

The Iron Age

A Review of the Hardware and Metal Trades.

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Single Spindle Foot Drill.

Among the new tools which the Pratt & Whitney Company, of Hartford, Conn., are manufacturing is the Single Spindle Foot Drill, which we illustrate. The table of this machine is raised solely by the foot actuating a treadle, which, by means of a connecting rod inside the hollow column, engages with a horizontal lever, the outer end of which is yoked to embrace a collar on the supporting sliding-bar of the table. The table has an extreme vertical movement of three inches, which may be reduced, by means of a screw and check-nuts, to any less distance desired. The cone has four grades of speed, carrying a one and a half inch belt. The spindle may be run at a very high rate of speed, there being no danger of its heating. Small drills of this kind have become almost a necessity in the shop. This neat and handy tool seems in every respect to meet the requirements of the shop.

American Institute of Mining Engineers.

The following are abstracts of papers and discussions at the June meeting of the Institute, held at Philadelphia:

TECHNICAL EDUCATION.

Synopsis of the discussion at a joint meeting of the American Institute of Mining Engineers and the American Society of Civil Engineers, June 19.

The address of Mr. A. L. Holly, president of the Institute of Mining Engineers, at its Washington meeting last February, and the discussions on the same, evoked a widespread interest, and created a desire for a further and more elaborate discussion of the subject. The meetings of the two societies above named at the same time at Philadelphia, seemed to offer the requisite opportunity for such a discussion. The added fact of the presence in the city of a large number of foreign gentlemen, interested in a greater or lesser degree in technical education, gave to the discussion a greater value.

The joint convention was called to order by Mr. A. L. Holly, the president of the Institute, and on motion, Prof. R. W. Raymond was called to the chair. In opening the discussion he said there were two classes of technical education—the education of students for the engineering profession and that of the workmen. The evils of trades' unions, and that system known as a division of labor, by which a workman was restricted and kept down to a particular specialty were strongly denounced. These specialties or divisions of labor interfered with the progress of the education of the workman, because as he became more valuable to his employer it became the interest of the latter to prevent his rise beyond the point he had already attained. Reviewing the different systems of education, the speaker alluded to the teaching of drawing, and other elements of technical education, in the Cooper Union schools of New York, with their 1500 workingmen students, which studies emancipate them from the monotony of their occupations, and give them both the ambition and the power to rise into new and influential positions. If this course was generally applied, engineering superintendents would be selected from among workmen. The speaker went on to demonstrate, among other phases of the subject, the necessity for a general and practical education for the student of metallurgical engineering.

Mr. Thomas C. Clark, of Philadelphia, of the Society of Civil Engineers, being called upon by the chair, contributed a valuable paper upon the theory of education in practical, civil and mechanical engineering, showing the distinction to be made in the treatment of the two classes of students, viz., those of executive ability, having a turn for the administration of affairs, and those of a scientific bent, inclined to find the reason for everything.

Capt. Douglass Dalton, of London, being next called upon, spoke of the experience of the India government in the establishment of a school for engineering at Coopers' Hill, near London, as showing the difficulty of inculcating by means of a school a practical knowledge of the science. The system in the school had been much like that which had already prevailed in India, under which officers of engineers who had been educated theoretically had acquired their practical knowledge at the expense of the government. But the rule in England is for civil engineers, first of all to receive a somewhat liberal education in college, and then to go as pupils to the leading chief engineers for a specific time. From that state of pupilage they pass into some system by which they settle themselves on their own basis. Mechanical engineers invariably go as pupils into the shops of leading machinists, and as a rule pass through every portion of the mechanical work in those shops in detail, including the drawing room. The speaker concluded that, however much attention was given to a young man, it would always depend upon the young man himself as to whether he makes an engineer or not.

Dr. Wedding, of Berlin, the next speaker, in describing the mode of instruction in Ger-

many, said that a good preliminary education is requisite for admission to the academies where engineering is taught. The students are first given a practical training in puddling furnaces, or smelting establishments, and are then carried through a full course of instruction, embracing all the branches of science which can be applied to engineering. A lengthy discussion followed, each of the speakers being called upon by the chair. A practical insight into the details of the profession, a knowledge of men, which was to be attained only by starting at the bottom and going up through every department, was held by Mr. Pechin, of the Dunbar Iron Works, to be essential to the training of the engineer.

Coleman Sellers, Esq., of Philadelphia, spoke of what was almost the first act of the Franklin Institute (founded 50 years ago by some earnest mechanics) in establishing schools for drawing. These, for many years, were the only drawing schools in Philadelphia, and from them sprang the present School of Design for Women. An examination of the free school system of this and other States would show that it was with the utmost difficulty that free hand drawing was introduced. The foundation of all education (the speaker held) was that which was the universal language of the world, the language of pencil on the paper, expressing in form what we desire to explain. If that language was universally taught the workmen would be better off. But, unfortunately, the education of the schools was directed toward making our young men accountants or giving them an idea of being doctors or lawyers. Not one word was taught them as to the meaning of a monkey wrench or the other tools of machine shops. This underlies the whole trouble in the common schools of America. If the students were given a knowledge of drawing or something of technical education, though in its crudest form, they would be ready for something higher. Leaving the free schools, they are taught in the high schools and in night schools something of drawing and the exact sciences, which is undoubtedly useful. The speaker went on to give from experience in the training of his own sons some valuable advice to parents desiring to make engineers of their youths.

Mr. Ashbel Welch, of New Jersey, in reference to the high and responsible standing of the engineering profession, referred to the comparatively enormous proportion of the lands of the United States, which was owned by railroads, controlled by a few hundred men, who were mainly engineers. If stockholders could feel assured of strict integrity among the engineering class, then the railroad stocks would rise from 10 to 20 per cent. Integrity, he thought, was one of the most important elements to be inculcated in the training.

Professor Fairman Rogers and W. Milnor Roberts also participated in the discussion. Mr. A. L. Holly, believed that the strict curriculum of the school had become noxious, and that technical education had become so directed as to make the student learn from nature. He did not think that a complete knowledge of engineering could be formulated.

Mr. Alfred P. Boller, of New York, spoke in favor of studying from nature, where the best practice can be obtained. To his mind, practice, and not theory, makes the engineer. The present system of graduating young men and calling them full-fledged engineers, was a farce. An engineer is only entitled to the name after a long practice, such as would qualify him to act as assistant. Too much attention is given to abstract mathematics.

Mr. Eckley B. Cox thought a certain amount of aesthetic culture was requisite to make an engineer. A liberal education, to him, seemed to be necessary before a young man should go into a shop. The student should be thoroughly grounded in physics and in mathematics. The object of the school should not be to graduate the greatest number of engineers but to turn out the greatest quantity of engineering ability.

Mr. William P. Shinn believed that the science of accounts should be grafted in the education of engineers, as it is as necessary to him as to the lawyer. A dislike of business forms detracted considerably from the worth of an engineer.

Prof. Eggleston, of Columbia College, New York, stated his views at length, holding that a high preliminary education was essential to success. He would have the student well edu-

cated in the languages, especially the German, as from the text books and writings of men of that country he could glean a vast deal of useful knowledge. He would also impart the universal language, that of free-hand drawing, as it may be called. The system of "forcing things," as he termed it, and making practical men out of green college students, he deprecated severely, and said one of the greatest faults of the colleges of the present day was that they strove to graduate too many students at one time, because some rival or a neighbor did so, and in this way a quantity of diluted intellect, which did no one any good, was diffused—a source of annoyance to the student himself. The trouble with the present system of education was that the practical was left out in teaching the theoretical.

Mr. Robert W. Hunter, of Troy, N. Y., was convinced that it would be advantageous to the management of works to introduce engineering classes, by which means the practical details could be more speedily learned.

Prof. C. O. Thompson, of the Free Institute at Worcester, Mass., held that theory and practice must go hand in hand, a principle exemplified in the success of the Institute with which he was connected. Having an endowment fund of \$600,000, there was sufficient money to carry out the idea. The students, all young, were educated in the machine shops and in the academy, time being devoted to each. Thus with the theoretical was acquired a practical



SINGLE SPINDLE FOOT DRILL.

idea of what they were being taught, learning quicker and the ideas remaining fixed. He objected to practical training first, because as the mind became older it grasped with less readiness ideas easily instilled in youth.

Prof. J. H. Davis, of the University of Michigan, and Messrs. P. H. Dudley and Frederick J. Slade, of Trenton, also participated in the debate.

Mr. Ashbel Welch, of Lambertville, N. J., then moved that a committee be appointed to consider what steps are necessary to stop the practice adopted by technical institutions of issuing diplomas to graduates as civil engineers. This motion was heartily seconded, but no action was taken upon the suggestion, the president ruling that such a proposition could not be entertained because it was not clearly within the province of the meeting.

Before adjourning the meeting, the president, Dr. Raymond, of New York, summed up the discussion as having showed that a general knowledge of tools and mechanics was necessary before a student should enter into theoretical study. The conference was then adjourned.

ON THE NOMENCLATURE OF IRON.

By Dr. Wedding, Berlin, German Commissioner to the Centennial.

Dr. Wedding introduced his paper by pleasantly alluding to the fact that its subject matter was not specifically scientific, but more general in its nature; indeed, he might say it was international, and surely he could be excused for treating on a subject of that nature at this time, when Philadelphia was itself international. Contrary to the generally conceived idea that a German was warlike, his mission was that of a peace maker.

The German language is an original language, and it is, therefore, impossible to change the meaning and signification of a word at will. In a language that is not original, but combined, like the English, it may be easier to

assimilate and exchange. As an illustration of this, I refer to that word, the meaning of which is occasioning so much discussion at the present day, "stahl," in English, "steel." This word in German always conveys the idea of a substance that can be hardened. As the German literature in relation to metallurgy is the oldest of the modern world, this circumstance may give us a right to ask that this definite meaning may be considered in settling the precise meaning of this word. However, as the four peoples, German, Swedes, French and English, compete in the richness of their metallurgical literature, it is very necessary to reach a uniformity in the nomenclature of iron, that would prove useful not only for scientific purposes, but equally for trade. For this purpose, I propose to make such divisions of iron that the word steel shall be used only as applicable in a very inferior range, not as formerly in the first order.

Nature furnishes us iron mostly in the state of oxides, or, if otherwise, these minerals must be reduced to this state in order to work into iron. The oxides are always mixed with certain substances, which may be called rocks. This necessitates, in the first instance, two processes, one to reduce the iron and give it the right amount of carbon necessary for technical purposes, and the second, to separate the reduced and carbonized iron from the rocks. The reducing is always done by carbon or carboniferous substances (coke, anthracite, carbonic oxide, etc.), and gives, in accordance with the amount of heat used, either a malleable iron or a non-malleable iron. The process of making malleable iron in this way is called generally the direct process, such as that of Mr. Blair, in German, *rennen*, in English, *run iron*, in a solid state, and a fluid clinder. By this process our ancestors made all their iron, and it has been tried to make iron in the same general way, but by different modes, in recent times, but, so far as I know, without making it a commercial success. The product of this method we call *renneisen*, with the sub-divisions *renneisen* and *rennstahl*, for which I propose in English the name run iron, French, *fer de louf*. With a larger amount of heat you get an iron, which is too rich in carbon to be malleable. This is generally called pig or cast iron (*roh* or *gusseisen*); French, *fonte* or *fer fondu*, and is made in the blast furnaces, rocks and iron being separated, both in a fluid state. There could be a third method, namely, to let the rock remain in a solid state, and make the iron flow. This method is not practicable at present. The largest part of the iron used in the arts enters into them in the malleable state, and, therefore, most of the pig iron must be converted into that state. This is done by a process which takes out a certain amount of carbon, and also some other substances, principally silicon. The processes, the three most extensively used being the charcoal firing, the puddling and the Bessemer process, are called in German *frisch process*; English, *fining*; and for the product I propose *frischeisen*. English fired iron—sub-divisions may be charcoal hearth iron and steel, puddled iron and steel, Bessemer iron and steel; French, *fer affiné*.

It often occurs in these processes that by purpose or by inevitable accidents the carbon is taken out to too large a degree, even to the extent of oxidizing the iron in some degree. In these cases it is necessary to combine with the iron substances which either combine simply with the oxygen or combine with the oxygen and carbonize the iron. To accomplish this we have different processes, as for example, the converting process, which puts carbon into iron which is only heated, not smelted; but the way most used at present is to make pig iron, often *aplegeisen*, or a similar substance, containing manganese or silicon, with the fired iron, in order to get rid of the superfluous oxygen and increase the amount of carbon. In these cases we have as a result a molten product. Therefore, we call this product in German *flusseisen*, with the subdivisions of *flusseisen* and *flusstahl*, and I propose in English, the name of flow iron or ingot iron. French, perhaps, *fer coule* or *fer de l'ingot*.

If desired, iron can be made by any one of these processes containing any degree of carbon; as, for example, Parry made cast iron and fired it by the Bessemer process, or run iron can be smelted with pig iron. This makes no difference with the nomenclature. I shall be pleased if this paper guides to a certain international nomenclature, which, in my opinion, is so very necessary.

PARTIAL RECONSTRUCTION OF A FURNACE CRUCIBLE WHILST IN BLAST AT QUINSMONT FURNACE, W. VA.

By J. H. Bramwell.

Mr. Bramwell began by lamenting that furnacemen did not oftener note down and publish the methods they have adopted to overcome the practical difficulties they have met with in their experience.

The Quinsmont Furnace, he proceeded to state—60x15—had been in operation but two months when it became necessary to draw the tuyeres out a distance of 18 in. in order to give them a resting place, the brick-work under them being completely cut away, so that after each cast they would sink from 6 to 8 in., requiring a loss of from 1 to 1½ hours in raising and resetting. The tuyeres had been intentionally retained in their original position as long as practicable, in the hope that the cutting out would be retarded. This, however, did not prove to be the case, the process of destruction continuing as rapidly as ever.

The original thickness of the crucible wall, 3 ft., was now reduced to 18 in., and breaking out of iron was a frequent occurrence. As a still further protection, a wall of brick was carried up encircling the hearth with an annular space of 3 in., which was filled in with fragments of fire brick, upon which a constant stream of water was kept flowing at several points. This did not suffice to preserve the brick, for, at the expiration of a month the walls had become so thin that the tuyeres could not be maintained, even in their new position, without great loss of time in resetting. The quantity of fire brick and clay used in the operation eventually mixed in with the iron, so that the old experience of fire brick and iron not working well was repeated with monotonous regularity at each cast. The setting of the tuyeres finally culminated in one falling into the furnace, when it was decided to attempt to rebuild the hearth in sections and at intervals. A section of the crucible measuring 7 ft. on the outer circumference, 4 ft. on the interior and 48 ft. high, was first removed. Commencing at the open tuyere arch, the air was excluded and stocks held back with a heavy body of clay, tightly rammed with fire brick, and driven back simultaneously with the removal of the old work, and far enough to admit a 30 in. wall being set in with 15 in. blocks 6 in. thick, the entire operation requiring 30 hours. Quite a flow of clinder and some iron occurred as the last two courses of fire brick were raised, but was readily removed, and did not prevent a clear foundation being secured 6 in. below the level of the hearth bottom. Two weeks later a section 5 ft. x 5 ft. x 48 in. was taken out on the opposite side and rebuilt in the same manner; and later still repairs of a similar nature were carried out in the brick arch. A raising of the brick was anticipated but did not take place, and beyond a slight bulging no trouble was experienced. The furnace was kept very dry for several weeks, giving an excellent opportunity for the work to close up. The furnace was operated seven months longer without exhibiting any signs of weakness. Eventually, the cutting out of the boshes necessitated its going out of blast. On blowing out the renewed sections were comparatively intact, and the intervals of old crucible wall, between the new sections, had filled in and taken up.

ENDURANCE OF IRON RAILS.

By W. E. C. Cox, superintendent P. and R. R. R. Rail Mill, Reading.

In 1857 the P. and R. R. R. Co. made a contract with the Fairmount Rolling Mill for the rerolling of some 4000 tons of iron rails. The essential features of the agreement were that the old rails should be piled with puddled iron and rolled into flats for the rail pile, which latter was to be of a section seven inches square, and, after being heated and reduced by rolling to a bloom of a section about five inches by six, was to be reheated before being finished in the rail of the T-pattern. Great care was exercised in the execution of this contract, and the rails being distributed over all parts of the road, gave general satisfaction by their excellent wear. Five years afterward the principal proprietor and manager of the Fairmount Rolling Mill was elected president of the Reading Railroad, and many of the rails made under his supervision were still in use in the tracks of the company. His first efforts were directed to procuring more rails of the same character. Makers refused to bid because of the details of the specification, mainly because of the price offered not paying for the labor and coal consumed in the changes made necessary by the departure from the established methods of working. Most of the new rails were, therefore, bought, and the old rails rerolled, without regard to any particulars as to the manner of piling, heating, etc., each manufacturer furnishing what he deemed the best article possible for the money.

The result was so unsatisfactory that the company determined in the latter part of 1866 to erect a rolling mill, and manufacture for themselves. As Bessemer steel rails were just beginning to be imported, their future was

[Continued on page 15.]

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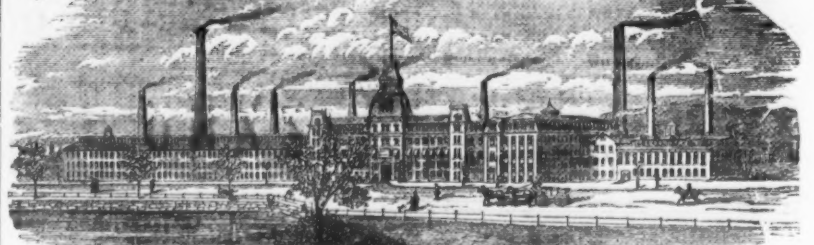
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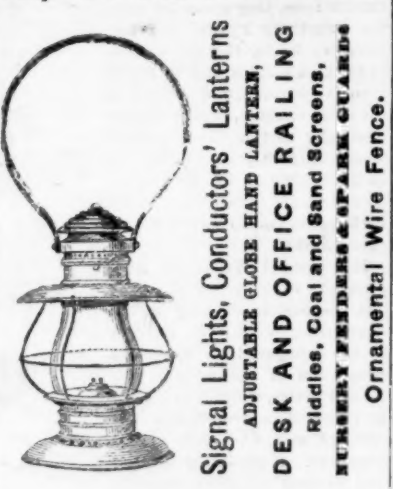
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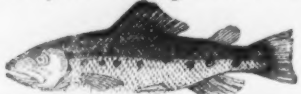
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GALVANIZED CHARCOAL WIRE
ROPES FOR SHIP'S RIGGING.**
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Wheels and Rope for transmitting power long distances. Send for Circular and Pamphlet.

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Under the New Patented Process.

This preparation will not wear off, soak out, or
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Sledges, Hammers,
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All warranted the Best Solid Cast Steel.

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liberal discount to the Trade. Bell Hanging and Jobbing
done to order.
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**REDUCTION.
Manila Pails**
REDUCED TO \$7.50 PER DOZ.



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water, hot or cold.
Are Durable, Light, Strong
and Tasteless, have no
hoops, and will not absorb
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**Iron Wire, Curled Hair
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Hair & Wire Gravy Sieves.
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Coal and Sand Screens.
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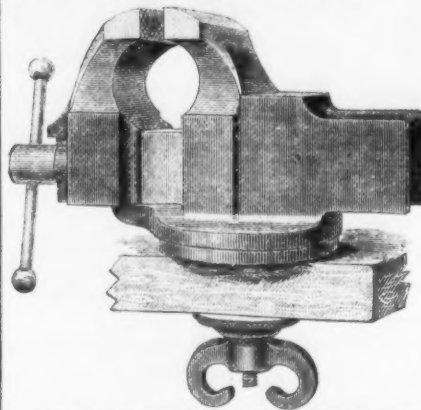
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UNION METALLIC CLOTHS LINE
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Blatchley's Horizontal
ICE CREAM FREEZER**
(Tingley's Patent)



For Saloons, Hotels, Fam-
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tures, it is the best work, is en-
tirely unequaled. The
closed head will save ice
enough in one season to pay
for the machine. The tub
requires out one filling to
freeze. Size, 8 to 40 quarts.
Visitors are cordially invited,
to come and see us, or send for des-
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New Model Swivel Vise.

The advantage claimed for this Vise over the
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Solid Box Vises, Hammers, Sledges,
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Our Vises are warranted to do more work than any other make. No broken boxes or screws.

The Faultless Fruit Can.

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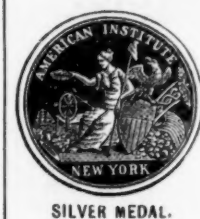


The perfection of this article, in all the essential points of a good
fruit preserver, has been thoroughly demonstrated by the immense num-
ber sold. The demand increases, but with largely increased facilities we
shall be able to meet the wants of the trade. As the can tapers slightly
when made up, they are put together, thus saving space greatly. The
opening is the full size of the top of the can, admitting of perfect clean-
ing and drying; and so making them much more durable.
When not in use for Fruit, they make a very nice receptacle for Tea,
Coffee, Spices, etc., the close fitting cover making it air-tight.
Another important feature is the labeling device, whereby the con-
tents of the can, date, and method of preserving are easily shown.
We furnish the complete trimmings for the **FAULTLESS CAN**,
including the body all ready for soldering, at the following very low prices,
viz.:
\$9.50, 1 qt.; \$10.50, 1 1/2 qts.; \$12.50, 2 qts. per gross.
Cans made up ready for use:
\$9.75, 1 qt.; \$10.75, 1 1/2 qts.; \$12.75, 2 qts. per gross.
We would caution dealers against an imitation of our can having a
"swell" or "dead" near the top to prevent the cans sticking together when
needed, as this feature is covered by our Patents.
The Trade only supplied.
Use good sealing Wax for this, and all other cans, to secure good
results.

F. STURGES & CO., Sole Manufacturers,
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**Cherry Heat Welding Compound.**

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This compound is put up and warranted genuine only in 1, 5, 10, 50 and 100 lb.
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It is also for sale in 1, 5 and 10 lb. packages by Hardware Dealers generally through-
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Manufacturers of
JAPANNED AND PATENT BRIGHT METAL

Bird Cages.

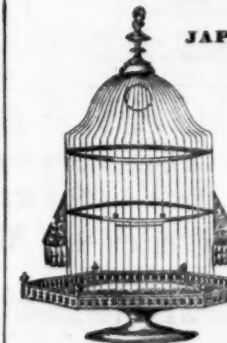
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Chisels.

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Gouges of all lengths, and circles beveled inside or outside. Nail Sets, Scratch and Belt Awns, Chisel
Handles of all kinds. Orders filled promptly; generally same day as received.

Conditions of Excellence in Plumbing Work.

Abstract of a Report to the Public Health Association
of New York, by James C. Bayles, Chair-
man of Committee on House Drainage and Water
Service.

In the brief report which we have the honor
to offer this evening, I shall present a few facts
of interest which we deem of prime importance
in connection with drainage and water services
in houses drained into sewers and supplied from
public mains.

It is because of the conditions with which
we have to deal—especially those pertaining to
foul and unventilated sewers, of bad construc-
tion and inadequate capacity—that the problem
of sanitary house drainage presents so many
practical difficulties. Were our sewers well
ventilated, we should have a very simple prob-
lem for consideration. As it is, however, the
difficulties are more apparent than real, for
with good materials, good workmanship and
adequate ventilation for waste pipes, experi-
ence has shown that it is possible to drain
houses even into foul and unventilated
sewers, without danger of bringing poi-
sonous gases into them. These three essential
conditions of safety will be briefly considered
in this report.

GOOD MATERIALS.

In much of the plumbing work of the time
we see exemplified the worst evils of the con-
tract system. Bids are made by competing
plumbers on loosely drawn specifications;
sometimes upon a close calculation of how little
the work can be done for; sometimes with a
knowledge of what others have bid; and some-
times with a reckless purpose to get the job by
putting the figure so low that no one is likely
to go lower—the bidder feeling certain that he
can make a profit out of it in some way. The
sharp competition which now exists in the
plumbing business enables builders to get
work done very cheap by contract, and as work
cheaply done is rarely worth more than is paid
for it, we find a growing demand for cheap and
inferior materials. It is not unusual to find iron
soil pipe used which is utterly unfit for employ-
ment in buildings. We have seen pipe set up
in houses which, tested with callipers, has been
found to be not more than an eighth of an inch
thick. The objections to this kind of pipe are
numerous and important. It does not possess
the requisite strength; it is too quickly eaten
through with rust, and it is very apt to have
sand holes in it which soon develop points of
leakage. The difference in cost between light
pipe and that of suitable weight is not great
enough to make the economy profitable. We
learn upon inquiry in the trade that the principal
demand is for very cheap and light pipes.
As made, they are as hard as chilled iron—
owing to the fact that they are cast so thin—and
almost as brittle and difficult to cut as glass. If
dropped they are very apt to crack, and in this
condition are often put in by careless workmen,
who are unwilling to report the fractures they
have caused in handling, for fear they will be
charged with the price of lengths to replace
those broken. In much of the cheap work of
the time we find 4 inch iron pipes used,
which average about 8 lbs. to the foot.
In good work, 4 inch iron pipe should weigh,
at least, 12 lbs. to the foot. Pipes of
this weight, well made of good iron, can be had
in the market, and they should always be called
for by architects.

In lead pipes the objections to light weight
are based chiefly on the fact that they are not
durable, and are more readily perforated by
corrosion than pipes of proper thickness.

When cheap materials are tolerated at all by
builders, we usually find them in all depart-
ments of the plumbing work of a house.

Among the worst evils of the present time
are the cheap pan and valve closets now so
generally used. Wrong in principle, flimsy in
construction, and liable to constant derange-
ment in their working parts, they are, as the
rule, a perpetual source of trouble, a constant
nuisance, and almost always a constant danger.
So long as the contract system is tolerated,
so long will cheap material be used in plum-
bing work. If we force plumbers to bid below
the cost of good work, we cannot expect them to
lose money in executing their contracts. If
we expect them to do a dollar's worth of work
for fifty cents, we expect to cheat them, and we
have no good reason to complain if we find
that we ourselves have been cheated.

We now come to the consideration of the sec-
ond condition of safety—namely:

GOOD WORKMANSHIP.

In New York there is no trouble in getting
work done well. If we are willing to employ
honest and capable men, who will demand a
fair price. There are plenty of plumbers who
know how to do good work, and will always do it
if we give them a chance. In a consideration of
the subject so brief and general as this report
must necessarily be, your committee cannot
point out what they believe to be the difference
between good and bad workmanship in plum-
bing. To do this would be to present a complete
manual of the plumber's art. We can only say
that good workmanship can be had whenever
there is a demand for it, and the difference in
cost between good work and bad is far less
than is commonly supposed. The most moder-
ate bills for plumbing work we have ever seen
—quality, durability and economy of repairs
and repairs considered—have been those pre-
sented by plumbers who have been given a *carte
blanche* to do work as they thought best.

In the judgment of your committee, the im-
portant, incompetent and dishonest plumbers,
whose work we see around us on every side, are
the legitimate product of a pernicious system
encouraged by builders and tolerated by the
public, and that with the abolition of that sys-
tem he will disappear from the ranks of the
trade. Two or three instances which have come
to the notice of your committee will serve to

show the effect of this system in lowering the
standard of workmanship. In one of these
instances a plumber working by contract had
substituted three-quarter inch gas pipe for the
lead pipe called for in the specifications in all
positions where the fraud could be covered up
and hidden. In another case the contract for
plumbing work in a row of new houses was
awarded to a man who underbid all competitors.
He did the work, and while it was not well done
in any respect, it was accepted and paid for.
The houses were subsequently sold and occu-
pied, but it was not long before the foul and
offensive condition of the cellars attracted at-
tention and led to an investigation, which re-
vealed the startling fact that in no case had
any connection been made with the sewer. The
soil pipe was carried down to the cellar and
far enough underground to conceal the fact
that it ended there. The drainage of the houses
had been emptied into the soft "made ground"
constituting the cellar bottom, and when the
soil ceased to absorb it, the smell gave warn-
ing of the nature of the evil to be remedied.
The architect had taken it for granted that
the soil pipe would be carried out to, or in
some way connected with, the sewer, but this
was not specifically called for, and the plumber
had taken advantage of this omission to save
expense. These are extreme cases, and are only
used by way of illustration. We do not usu-
ally find dishonesty in the matter of work-
manship carried so far, but it commonly goes
far enough to give rise to conditions prejudicial
to health, if not fatal to life.

In the judgment of your committee, the only
remedy for bad workmanship lies in educat-
ing the public to an appreciation of the im-
portance of good workmanship. Character and
experience should count for something, and those
who build houses must be willing to let the
plumbers make as large a margin of honest
profit as mechanics in other trades are al-
lowed.

VENTILATION FOR WATER PIPES.

The third and last condition of safety to
which your committee would call attention is
good ventilation for the waste pipe system of a
house. From the best information we can ob-
tain, we believe that the soil pipe of a house
should be carried from the sewer to a point
above the roof with but one bend, and without
diminution of size in the upper lengths. We
believe, also, that there should be no trap in
the soil pipe at any point, and that the sewers
should be allowed to "breathe" through the
pipes. When basins, baths or water closets are
located in such positions that a long branch
waste is needed to connect them with the soil
pipe, said branch waste should be carried up
and above the roof. The only exception to this
rule is in the case of houses in which the
plumbing work has already been done imper-
fectly, and where leaks in pipes cannot be
closed. In such cases the pipe had better be
trapped below all house connections.

The importance of waste pipe ventilation
seems to be very fully appreciated by sanitari-
ans and by plumbers, but not by the general
public. The idea seems to be that, as traps are
specially intended to close waste pipes against
an inflow of sewer gas, any further precautions
taken to secure that end would be superfluous.
This idea is, of course, a mistaken one, based
upon a misconception of the conditions exist-
ing in sewers and the forces at work to dis-
place, or saturate with gaseous impurities, the
water seals in traps. From careful and re-
peated experiments made under conditions
favorable to fair and unprejudiced judgment—
experiments which we should be glad to repeat
in the presence of this association, when op-
portunity shall be accorded for a fuller and
more comprehensive report—your committee
are satisfied that but little dependence can be
placed upon traps of the usual 8 or half 8 form.
We have found that their tendency to become
unsealed cannot be guarded against under any
but exceptional conditions, and that additional
security is not attained by giving them more
dip. This objection does not apply to all traps,
however, and we take pleasure in calling your
attention to a device of this description, in-
vented by a skillful and intelligent practical
plumber of Brooklyn, Mr. John Foley, which
we are satisfied cannot, under any circumstan-
ces, be emptied or unsealed. The trap is adapt-
ed for use in all situations where traps are
needed, and while its water seal offers no great
barrier than those in traps of other forms
and equal capacity to the passage of sewer gas
by the process of absorption and transmissio, it
only requires to be supplemented by the ven-
tilation necessary under all circumstances, to
make it perfectly safe and satisfactory.

In concluding this very incomplete and un-
satisfactory preliminary report, your committee
would say that the only noteworthy improve-
ment of recent date which has come to their
notice in connection with water service, is a new
pipe made by Messrs. Tatham Bros., of this
city. This is a wrought iron pipe with a con-
tinuous tin lining. The iron pipe is made in
the usual way by lap-welding. A tin pipe
drawn to the required size is then slipped with-
in the iron tube and expanded by hydrostatic
pressure until it is locked firmly in position by
conforming to all the inequalities of the iron
surface. The screw couplings are also lined
with tin by a very ingenious method, and tin
washers are provided for insertion in all con-
nections, which are so formed as to insure the
maintenance of a continuous tin lining of suf-
ficient thickness to resist the corrosive action of
any water which would not destroy black tin
pipe. Your committee consider this pipe theo-
retically and practically perfect. It seems to us
to possess many practical advantages over tin-
lined lead pipe, the merits of which have been
so fully and conclusively shown in the public
addresses on water of our respected president,
Professor Chandler. These are the most
important of the recent improvements in
plumbers' materials which have come to the
notice of your committee. But few of the in-
ventions of this kind upon which letters patent
are granted possess any great practical value;
but the fact that so many are turning their at-
tention to the improvement of plumbers' mate-
rials is gratifying, as indicating an apprecia-
tion of the importance of improved drainage sys-
tems and a desire for progress in the all action
of sanitary reform.

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Manufacturers of and Dealers in

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Our specialty is in

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Used in the Construction of

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Books containing Cuts of all iron now made, and Sam-
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Manufacture the Patent C. Frugated Iron Shingles,
making the most durable roof in the market, not
affected by contraction or expansion, which causes
sagging in roofs to leak. Price only \$1.50 per square,
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enable them to offer Rails, when quality is con-
sidered, at lowest market rates.
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of the Company, and the enviable reputation
they have established for "CAMBRIA RAILS,"
are deemed a sufficient guarantee that purchasers can,
at all times depend upon receiving rails unsurpassed
for strength and wear by any others of American or
foreign make. Any of the usual patterns of rails
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Sept. 9th, 1873; Oct. 6th, 1874; Jan. 11, 1876.

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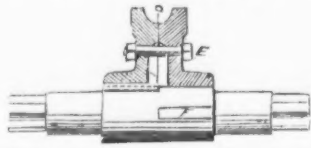
New Patents.

We take the following abstract of new
patents, recently issued, from the official re-
cord.

CONSTRUCTION OF GROOVED ROLLS.

To Emmanuel Richards, Reading, Pa.—May 16.

The roll is composed of two disks, which are
formed with projecting surfaces, the said sur-
faces being ground off enough to bring the

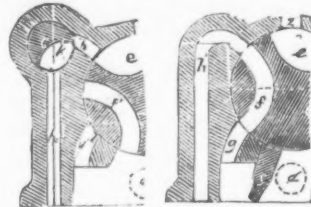


groove back to its original diameter when it
becomes enlarged by wear. A grooved welding
and sizing roll, constructed of the disks C C,
provided with projecting surfaces D D, attached
together by the bolts E E.

CUT-OFF VALVE.

To Geo. F. Meyer, New York, N. Y.—May 16.

The combination, with the rolling main valve
B, having an exhaust cavity, e, and independ-
ent induction passages f f as described, of the
externally adjustable hand plug or valve C, the
induction and eduction passage h in the valve
box or case controlled by the hand valve C, and



also by the main valve B, the separate eduction
passage h, controlled by the main valve, and
the passage h h.

177,336.—Machine for Charging Retorts.—Wm.
Foullis, Glasgow, North Britain.—May 16.

The machine is traversed on the track by hy-
draulic cylinders, pistons, connecting rods and
gearing. The charging scoop is raised and
lowered by chains, drums, a worm wheel and
tangent screw, and a hand wheel. It is pro-
jected into the retort, turned over, righted, and
withdrawn by hydraulic cylinders, chains, pul-
leys, &c. Cranes are provided with chains,
pulleys, &c., for raising and lowering the scoops
into and from the charger.

177,337.—Apparatus for Drawing Retorts.—Wm.
Foullis, Glasgow, North Britain.—May 16.

The apparatus is traversed on its rails by a
hydraulic cylinder having a rack bar, which
works in a pinion on a shaft, which works be-
hind the axle of the wheels on which the
machine moves. The rake is operated forward
and backward by water-power, and works in a
hydraulic cylinder having suitable valves and
ports.

177,346.—Stop Valve.—O. E. McMurray, Lan-
singburg, N. Y.—May 16.

The faucet is traversed on its rails by a
hydraulic cylinder having a rack bar, which
works in a pinion on a shaft, which works be-
hind the axle of the wheels on which the
machine moves. The rake is operated forward
and backward by water-power, and works in a
hydraulic cylinder having suitable valves and
ports.

177,351.—Faucet and Funnel for Oil Cans.—
Frederick Ochs, New York, N. Y.—May 16.

The faucet is detachably secured within a
funnel formed in the can by means of a screw
threaded cup.

177,386.—Hammer.—Eugene A. Ely, Madison,
N. J.—May 16.

The claws are made with sharp cutting edges
at their extremity, to cut away the wood in
which a nail head may be embedded.

177,437.—Steel Heating Furnace.—Wm. Swindell,
Allegheny, Pa.—May 16.

177,443.—Machine for Bending the Leaves for El-
iptic Springs.—Wm. M. Watson, Tonica, Ill.
—May 16.

177,447.—Saw Swages.—Calvin Adams, Russell-
burg, Pa.—May 16.

The interior faces of the covering plates co-
incide with the sides of the tooth at all points,
and prevent the same from twisting while be-
ing swaged. All of the parts are held together
by a stirrup and key.

177,450.—Globe Valve.—Henry Atkinson, Pitts-
burgh, Pa.—May 16.

177,475.—Lath.—Joseph F. Crawford, Caze-
novia, N. Y.—May 16.

177,491.—Rolls and Conductors for Rolling Metals.
—Samuel C. Fox, Pittsburgh, Pa.—May 16.

177,492.—Anchors.—Frank Francis, Vienna,
Austria.—May 16.

177,508.—Oil Well Tubing.—I. N. Hoadley.—
Butler, Pa.—May 16.

The well tubing is provided with openings
below the water packing, for the discharge of
gas from the lower part of the well to the in-
terior of the tube.

177,529.—Auger Handle.—James Magers, Ger-
vais, Oregon.—May 16.

177,529.—Portable Derrick.—Shirwood Y. Beams,
Belleville, Tex.—May 16.

7119.—Machine for Rolling Metals.—Reissued.—
Hervey Waters, Boston, Mass.—Patent No.
114,735, dated May 9, 1871.—May 16.

177,611.—Latch and Lock.—Horace L. Arnold,
Grand Rapids, Mich.—May 23.

177,628.—Process of Annealing Cast Iron Skates.
—Oliver Edwards, Florence, Mass.—May 23.

177,664.—Loom for Weaving Wire for Coal
Screens.—Charles P. Seltzinger, Scranton, Pa.
—May 23.

177,674.—Combined Door Roll and Chain.—
Wm. R. M. Adams, New York, N. Y.—May 23.

177,692.—Steam Boiler.—Geo. H. Corliss, Provi-
dence, R. I.—May 23.

177,708.—Hinge.—James K. Gillfillan, Syracuse,
N. Y.—May 23.

177,791.—Water Coil Steam Generators.—B. S.
Benson, Baltimore, Md.—May 23.

177,811.—Noiseless Panels.—Edward Curtis, New
York, N. Y.—May 23.

177,814.—Pudlock.—Adolph Delkescamp, South-
ington, Conn.—May 23.

177,846.—Key Fastener.—E. T. Jenkins, Brook-
lyn, N. Y.—May 23.

A clamp inserted in the key-hole, and held

to the shank of the key by a set screw, pre-
vents the key from being turned by burglars'
nippers on the outside.

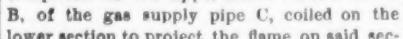
177,853.—Elastic Hanging for Revolving Ham-
mers.—Goldsbury H. Pond, New York, N. Y.
—May 23.

SELF-HEATING SMOOTHING IRON.

To Mary P. Jackson, Kennett's Square, and
Sarah P. Ball, Frankford, Philadelphia, Pa.—
May 23.—The inclination of the gauze promotes
draft. The coiled pipe projects the burning
gas to the outer edge of the lower section.

1. The combination, with a smoothing iron,
composed of the upper and lower sections A
B, of the gas supply pipe C, coiled on the
lower section to project the flame on said sec-
tion.

2. The combination, in a smoothing iron, of



the upper section and lower section with in-
tervening space, and an interposed web of
wire gauze surrounding and inclosing said
space.

3. The combination, with a smoothing iron,
of a wire gauze web, having a greater inclina-
tion outward toward the front than at the rear
of the iron.

4. The combination of the upper and lower
sections, the interposed wire gauze web, the
gas supply pipe, having a series of burner
openings, and an opening and cap for the ig-
nition of the gas.

7124.—Wood Screw.—Reissued.—Rich'd J. Nunn,
Savannah, Ga., assignor to S. Elliot, New
Haven, Conn. Patent No. 68,381, dated Sept.
3, 1867.—May 23.

In place of the usual nick, two slots or
notches are formed, one upon either side, and
with parallel sides oblique to the longitudinal
axis of the screw. These slots converge and
meet at the center of the upper surface of the
screw head.

7125.—Apparatus for Crimping Wire for Sieves.—
Reissued.—Charles P. Seltzinger, Scranton,
Pa. Patent No. 118,283, dated Aug. 22, 1871.
—May 23.

7126.—Flue Cleaner.—Reissued.—Addison Cros-
by, New York, N. Y. Patent No. 156,543,
dated Nov. 3, 1874.—May 23.

The following trade-marks were duly regis-
tered in the U. S. Patent Office:

3670.—Chuck for Drills.—The Victor Sewing
Machine Company, Middletown, Conn.—May
16.

3679.—Stencil Plate.—Samuel G. Monce, Bristol,
Conn.—May 16.

The representation of two hands, in the act
of putting together interchangeable stencil
plates or characters.

3704.—Edge Tool.—Ten Eyck Axe Manufac-
turing Company, Cohoes, N. Y.—May 23.

A symbol composed of figures of edge tools,
with the name 'Ten Eyck' and letters 'Mfg.
Co.'

3708.—Lock.—The Yale Lock Manufacturing
Company, Stamford, Conn.—May 23.

word 'Standard.'

3709.—Time Lock.—The Yale Lock Manufac-
turing Company, Stamford, Conn.—May 23.

word or title 'Yale.'

The following designs were duly patented in
the U. S. Patent Office:

9309.—Hand Wheel of Valves.—Edward G. Burn-
ham, Bridgeport, Conn.—May 23.—Term of
patent 7 years.

9311.—Spoon and Fork Handle.—Le Roy S.
White, Waterbury, Conn., assignor to Brown
& Brothers, same place.—May 23.—Term of
patent 14 years.

**An Important Decision in a Stove
Patent Suit.**

We take the following from the Troy Times:

The well known invention of Joseph C. Hen-
derson, of this city, for an improvement in coal
toves, for which a patent was obtained in 1860,
and which was subsequently extended to the
Commissioner of Patents, is just now attracting
the attention of some stove manufacturers in
different parts of the United States with feel-
ings of peculiar interest.

For a long time all who understood the char-
acter of the invention deemed it a very valu-
able one, in spite of the early unsuccessful ef-
forts to introduce it. Burdett, Smith & Co., of
this city, became interested in this patent some
years ago, and applied it to a stove made for
burning soft coal, known as the "Dubuque,"
and in this application the invention was very
successful, demonstrating the fact that Hen-
derson's ideas were correct, and all that was re-
quired to establish the invention was a proper
application of it. As soon as the "Dubuque"
had made this impression upon the trade, a
large number of stove manufacturers seized
upon the idea of appropriating the invention,
and this they did with unusual zeal, flooding
the country with cheaply made and poorly
mounted stoves to the great injury and detri-
ment of the owners of the patent. Suits were
immediately commenced against these infringe-
ers, and one of them, the Treadwell Stove Com-
pany, of Albany, came to grief yesterday, under
a decree entered up in the Circuit Court of the
United States for the northern district of New
York, Judge Johnson presiding, the court
holding that the Henderson patent was good
and valid, enjoining perpetually the defendants,
and sending them to a master for an account-
ing. The suit was conducted by Esck Cowen,
Esq., on the part of the complainant.

Other suits are in progress against the Cleve-
land Co-operative Stove Company, of Cleveland;
Ohio, and Taplin, Rice & Co., of Akin, Ohio,

while the papers are ready for a like invitation
to several other parties who will, in spite of ad-
monition and request of the owners of the
patent, continue to perpetrate what the courts
term piracy in this respect.

The invention is conceded to be a valuable
one, and there seems but little doubt among
experts that it is the only means that has been
devised to burn soft coal successfully in maga-
zine stoves. All who have seen the operation
of this invention as applied to the new stove
made by Burdett, Smith & Co., called the
"Equinox," think that the manufacturers of it
have about reached perfection in the art of
burning soft coal in magazine stoves, through
the advantages derived by the use of this in-
vention.

The Heavy Guns.

The military correspondent of the New York
Times, writing from London, gives some very
interesting particulars in regard to the new
guns and the tests that have been recently
made with them, which have developed some
new features. It will be remembered that the
81 ton gun had a bore of 14 inches. The re-
sults then yielded were deemed highly satisfac-
tory, and the gun was returned to the work
shop for the purpose of having the bore en-
larged to 15 inches. Greater power having
been obtained by the increased caliber, a still
further change was decided upon, which was
nothing less than an innovation in the so called
"Woolwich system," viz., by chambering or
enlarging that portion—about 40 inches—of the
bore where the cartridge is placed, commonly
called the powder chamber. This has now been
increased to 16 inches, leaving the remainder of
the bore intact. By this change it is claimed
that a more perfect combustion of the powder
takes place, although the cartridge has been in-
creased from 27 pounds to 315 pounds for the
battering charge; also that the volume of the
gas is more often multiplied in the powder
chamber. Thus it has been ascertained that in
a bore of 24 feet the volume of gas in a 45 inch
chamber is multiplied 7-2 times, but in a 45 inch
chamber only 6-4 times.

Having at last obtained guns of large bore it
became necessary to resort to the American
system of large grain powder, and a series of
experiments have been tried covering the
ground that was gone over years ago in this
country to ascertain the proper size of grain for
such guns. During the recent experiments
eight rounds were fired with the following re-
sults:

First Round.—Charge, 266 pounds; weight
of projectile, 1466 pounds; initial velocity,
1480 feet per second; mean pressure in powder
chamber, 20-64 on the square inch, ascertained
by means of pressure gauges.

Second Round.—The powder used was 1-7
inch cubes, the weight of charge being the
same, but although the pressure of the gas per
square inch showed 21 tons, being nearly three-
tenths more than the former round, the initial
velocity was 9 feet per second less.

Third Round.—Two inch cubes were used,
but the initial velocity fell to 1424 feet per
second, and the pressure gauges recorded 20½
tons.</

Iron.

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Cleveland, Brown & Co.

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NAILS, SPIKES,

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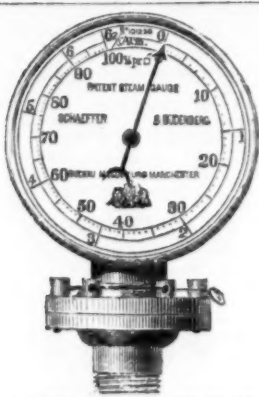
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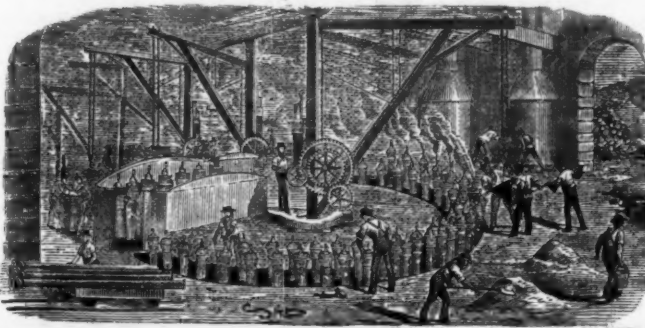
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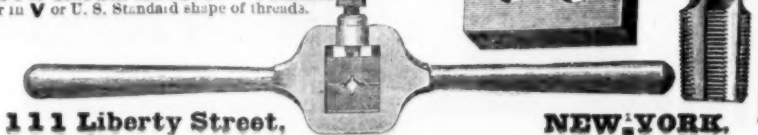
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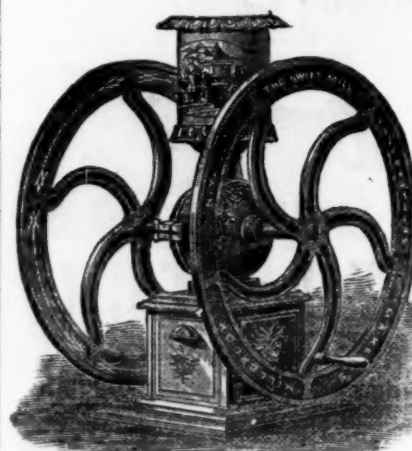
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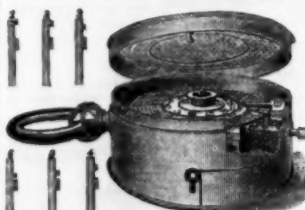
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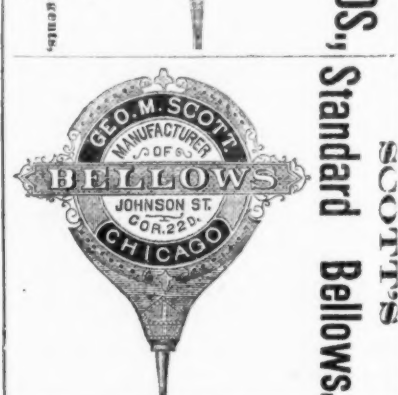
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The Sewage Systems of Large Cities.

The following brief description of the sewage systems of the principal cities of Europe and America will be of interest to our constituency of plumbers. The information was carefully collected by a commission appointed to report upon the sewage of Boston, and is contained in the public document containing his report:

London.—When water closets were first introduced in this city, about the beginning of the present century, they were connected with the sewers. The latter were large and badly constructed; and the pollution of the soil became so great that a law was passed forbidding their use as a means of discharge for the water closets or privies. Cesspools were then built all over the city, and the nuisance so increased that another law was passed, in 1847, requiring that they should be abolished, and that connections should, in all cases, be made with the sewers.

The contamination of the soil from these various sources became so great that, in 1866, during the cholera epidemic, posters were placed upon all the city pumps, stating that the water was not—none of it—fit for drinking purposes. Even at the present day cases of illness are not unfrequently traced to buried and forgotten cesspools, and many polluted wells are still in use.

In 1856 the stench from the discharge of sewage into the Thames had become intolerable; there had been two recent epidemics of cholera in the city (in 1849 and 1854), and the many evils in the sewage system had become so great that engineers and physicians had united in declaring the necessity of a change. As a consequence, the main drainage scheme was adopted, consisting of five sets of intercepting sewers, with four pumping stations.

The two outlets for the northern and southern sections of the metropolis are at Barking and at Crossness, respectively 10 and 14 miles below the city proper, and they are covered by the water at the time of discharge. At each outlet there is a reservoir capable of containing the ordinary sewage of 24 hours, if necessary. The discharge into the river from these reservoirs takes place only during the two hours succeeding high water, so that an abundance of time is given for the ebb tide to carry all the sewage to a safe distance.

In the City of London proper, where the land is quite high, the sewers are well finished, and they are ventilated by gratings placed at intervals, from one hundred feet to fifty yards apart, opening directly into the streets. Where the sewer-gases are especially foul, they pass through charcoal filters. Ventilation is also got in the different parishes by extending the soil-pipes through the roofs, by special pipes carried up above the tops of the houses, and in some cases by connecting rain-water spouts with the sewers without traps.

The sewers of the main drainage scheme are self-flushing, and are a perfect success; and the pumps work admirably, so that places so low that they must be protected from the Thames by embankments are thoroughly drained.

Many of the old sewers, however, especially where the sand and dirt from the streets are discharged directly into them, require cleaning from time to time. This is done by contract, and inspections are made every three months by the sewer department to see that it is properly done. They are also flushed by gates which hold the water back until the sewers are nearly full, and then, being suddenly opened, let it go with a rush.

Since the intercepting sewers were built the level of the ground water has been very much lowered, cellars formerly wet have become dry, and, in some few places, trees are even dying from loss of moisture in the soil.

The storm water is discharged into the Thames by overflows, some of which are so low that they are tide-locked at high water. Consequently, in case of very heavy rain at high tide, which, indeed, does not often happen, those cellars, which are placed below the grade established by the city authorities, are liable to be flooded. This difficulty, however, has been obviated for a great part of the city by means of a sewer for surface water only.

All the attempts to utilize the sewage of London have proved failures from a pecuniary point of view. There is no nuisance to the metropolis created by the discharge into the river, and the surveys of the Board of Works convince them that the harbor is not filling up at all from sewer deposits. In fact, Sir Joseph W. Bazalgette has given an opinion that the sewage actually helps scour the channel. All of the sewage of London goes into the Thames, except that corresponding to a population of 20,000, which is utilized, at some pecuniary loss, on an experimental sewage farm at Barking.

Liverpool.—The drainage of this city is a comparatively simple matter. Most of the land is quite high, and there are only 5210 acres. The sewers are, generally speaking, excellent. There are nine main branches, each having a separate drainage area, discharging into the Mersey at deep water—in one case by a siphon—and at points 8 feet below high water mark.* In the low part of the city there are nearly 300 acres occupied chiefly by warehouses and drained by tide-locked sewers; and, in case of heavy rain at high water, the damage done in the cellars of this district has sometimes been very great.

At the summits of the new branch-sewers, reservoirs are made of about five hundred cubic feet capacity, to be used for flushing purposes. In many cases, too, similar reservoirs are making for the old sewers, so that there will be finally several hundred of them; and they will be used as often as frequent inspection shows

*The tide, as in London, rises and falls about 90 feet.

flushing to be necessary. It is thought that some of them will never be needed.

The plans of all new sewers and of all alterations in the old ones must be submitted to and approved by the Health Committee before they can be carried out.

In the lower parts of the city nearly 8000 pipes have been carried from the sewers through the roofs of the houses, to be used exclusively for ventilation. There have been complaints of bad odors from them in only two or three instances, in which cases they have been removed. Charcoal filters were used, too, at one time at the upper ends of the pipes, but were soon abandoned, as they were found to obstruct the passage of the sewer gases.

In the better parts of the city, soil pipes are carried up through the roofs, and rain water spouts are used as ventilators in many cases where their upper ends are remote from chimneys and windows. The sewer department is also constructing ventilating shafts alongside of the manholes, and opening directly into the streets. The street gullies are trapped, and are flushed in the summer time, so that they never shall become dry.

A few years ago the sewage was carried to a point north of the city, and delivered by pumps upon a farm for irrigation; but the whole process was found so costly that it had to be abandoned. There is very little offence from the sewer outlets, and a commission of engineers has decided that the bed of the river is not obstructed by the deposits from the sewage.

Leeds, a city of 300,000 inhabitants, has sewers for two-thirds of its population. In 1871 they were served with an injunction obliging them to cease extending their sewerage system any farther until they purified the sewage before discharging it into the river Aire. They have tried the various precipitating processes, and are now using the A. B. C. in a modified form. The cost of their precipitating works has been £20,000, and their yearly expenses for working them amount to £15,000. The sewers are freely ventilated by untrapped street gullies.

Manchester, a city of 4516 acres, with a population of 356,000, has water closets for only about 50,000. For the remaining 300,000, ash closets, privies and cesspools are used, but the latter are fast disappearing. The ash closets are emptied daily by carts, at a cost four times as great as that of the water-carriage system, and in a manner which is certainly much less inoffensive. The idea of the authorities is that the river Irwell will thus be saved from pollution; but it is already so fouled by manufacturing effluents that it would be difficult to say whether slop-water and street-drainage do not pollute it so much that the additional discharge from the water closets would make any difference or not. The better classes—only a few of whom live in the city itself—insist upon having water closets in their own houses.

Birmingham has an admirable system of sewers, having water closets connected with about two-thirds of the houses. At the present time they depend chiefly upon one of the precipitating processes to clarify their sewage, but, owing to its great expense and its failure to purify the sewage, they are trying to secure sufficient land for irrigation. The cost of the works is £13,000 a year, beside the interest on the money invested. The return from the manure sold is trifling.

Bristol.—A long intercepting sewer has been built with its outlet four miles below the city.

Glasgow.—Water closets are used in the better parts of the city, and elsewhere ordinary privies or charcoal closets. The sewage of the city is discharged into the Clyde, which has been for nearly 20 years so fouled that people have avoided going up the river in steamboats during the summer. The sewers are not well ventilated, so that the gases ascend to the highest points, where also the best houses are, and are thought to give rise to a certain number of cases of typhoid fever. Typhus is common in the lower districts, where there are no water closets. In 1868, Messrs. Bateman and Bazalgette, in their report, proposed a main drainage system to carry the sewage out to sea many miles south of the mouth of the Clyde. Sir John Hawkshaw has recently been asked to make a report on the question, and it is not yet decided what is to be done.

Edinburgh has not yet completed sewers for all of the lowest parts of the city, but is contemplating doing so. The sewage of the northern part of the city, which formerly created a great nuisance by its discharge into the River Leith, has been intercepted by a main sewer and carried out into deep water.

Much of the sewage of the other parts of the city is flooded over four irrigation farms, which are profitable, but the sources of considerable complaint. It is proposed to build another long intercepting sewer on the southern side of the city.

The ventilation of the sewers is deficient, and, as in Glasgow, typhoid fever is observed in the houses of the better class on the high land, at the tops of the sewers. Typhus is not uncommon in the "Cowgate" and "Canongate," where the poorest classes live.

Three inspectors are kept constantly employed looking after house drains, and compelling house-owners to repair breaks and imperfections.

Dublin has, in the main, good sewers, but their discharge into the river Liffey is a source of so great annoyance that many business men have been obliged to remove their offices from that part of the city. The system of intercepting sewers with two siphons across the Liffey, proposed by Messrs. Bazalgette and Carrick in their report, it is generally supposed will be adopted, at a cost of £500,000. The sewage is to be discharged at deep water, several miles from the city, and at a point where it can be utilized by irrigation, if it shall be thought necessary to do so. The sewers are well finished, but not thoroughly ventilated, an evil which they mean to correct.

(To be continued.)

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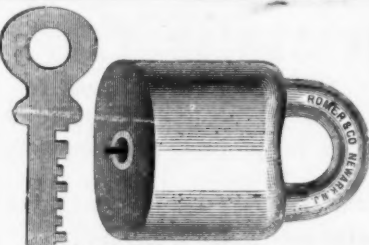


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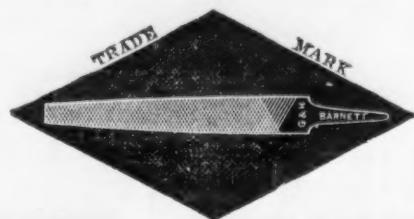
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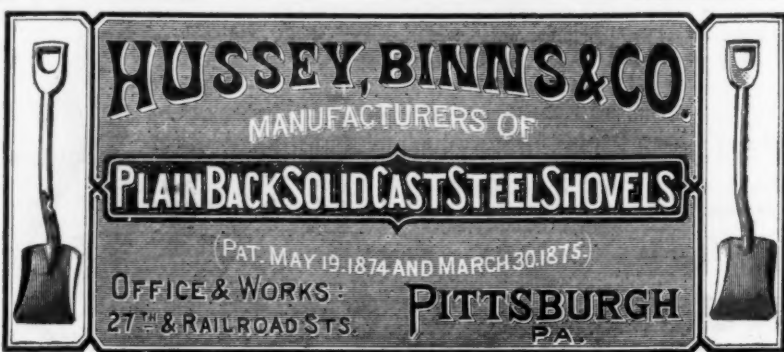
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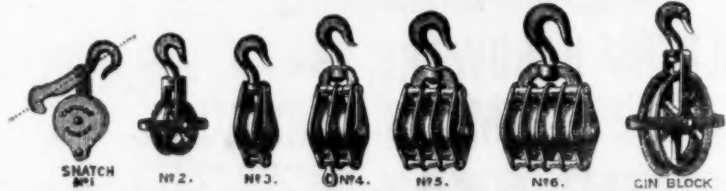
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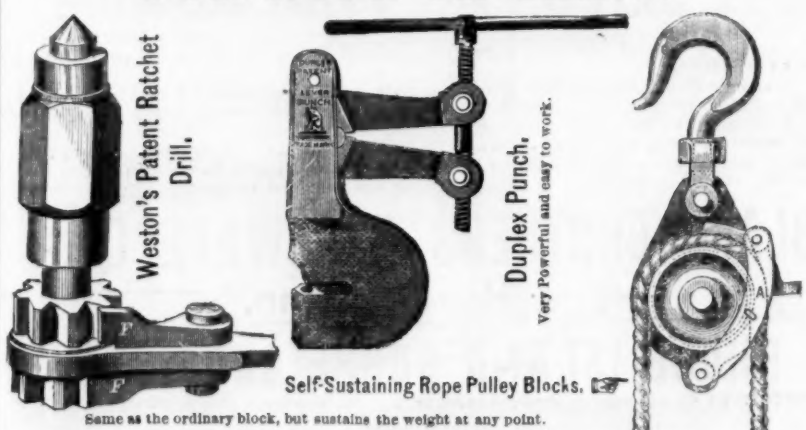
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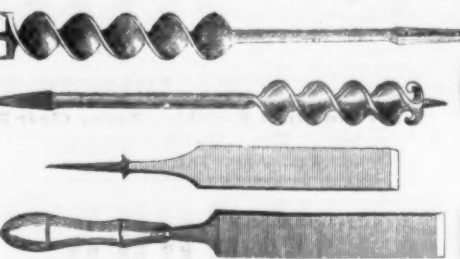
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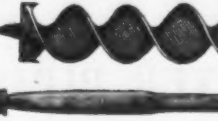
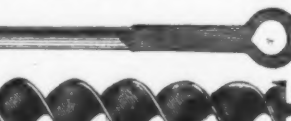
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The wheel is acted upon directly by the rail. The hub of this wheel revolves within chilled iron rollers. The difference between the diameter of the wheel and the diameter of the hub gives the leverage gained. The hanger has the advantage of this lever-
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Containing one each of the **FIFTEEN NUMBERS** of these Pens, will
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Grindstones.

BY J. E. MITCHELL, PHILADELPHIA.

In the whole range of mechanics, with all modern developments and enlarged capabilities, there has been applied no mechanism nor process yet able to supersede the grindstone in its peculiar office. It is the one thing in mechanic arts that improvement has not added to, or invention displaced; while the pruning hook and plow are of equal antiquity, the spirit of improvement has touched both but left the grindstone unchanged. Its utility in the early ages was great, and science has not lessened its value any by its perfection of other means for like results. It has been found in use among uncivilized people, and yet has its place with nations most advanced. Writers of fiction knew it would not conflict with the appearance of truth to ascribe it a place among barbarians. It is among the few implements of handicraft mentioned in Scripture, though there only named for milling purposes; it is the same in form and in universal use—a round revolving stone. In a scriptural research for the articles of handicraft mentioned then, we can look through the "eye of a needle" and find the grindstone beyond, its origin lost in the darkness of antiquity. It is not meant to confound the millstone of antiquity with the grindstone of to-day, which the Encyclopedia mentions as "a flatish circular stone of various diameters, employed in the cutting and sharpening of edged tools, precious stones, &c., and the grinding of steel, glass, pottery and the like. They are made of sandstone, or sandstone grit." The grindstone now has scarcely a wider capability or greater usefulness than when we first hear of it. Although limited as its qualifications may be, it serves its purpose as nothing else can. Improvement has furnished us wheels of composition which only, to some extent, serve some of its purposes, but the grindstone still remains unsurpassed. It is a tool of the utmost nicety in proper hands and properly understood, and is capable of performing with speed and precision its limited agency, beyond the powers of any modern tool. It is perhaps found best handled in its purpose of grinding dies for cut nails, where its proper use constitutes an occupation not to be attained very perfectly by a short apprenticeship with it. That known as the "head stone," used by makers of cut nails, is a tool of the utmost perfection of workmanship, not to be meddled with by the inexperienced, however lightly, without the result being noticed by the eye of the experienced nailer. The milling machine, the planer, the file, the lathe and emery wheel, do much of the work of the grindstone, but it still performs to perfection its useful though limited purposes. The importance and nicety of it, as a means to a purpose, is only known by those who know how to prepare and keep it in order.

Its utility or importance could not be guessed at, were one to look at a crooked and badly kept grindstone; but in the hands of those who know its merit, with its even surface running as true as any turned wheel, it will perform work with a rapidity and precision attainable by no other means. In the hands of those who are learned in its use and keeping, it is capable of adaptation to intricate and fine work, but with those who do not understand it, it is rude and the very opposite of what the educated craftsman would select for any purpose of fine employment.

An heirloom of antiquity, but used among us as we received it, and without any attachment or improvement; capable of its complete functions only when well kept and well applied, and this is only found with those whose craft education is solely to handle it. It alone can cut and shape expeditiously that which is prepared to cut and shape all other hard materials—cast steel hardened. It is still employed to give the finest edge, the most even surface, the brightest polish, and is the quickest to accomplish it. The emery wheel does but a few of its purposes, and nothing that we have could supply its place. The file has its own peculiar uses, but in contact with the grindstone, its thousand small cutting edges would be reduced to polished plainness. It is found a necessary implement on the farm, and is still required where the finest of instruments are made, or the hardest of metals are worked. It has come to us as we have it, and in all likelihood will pass on down to other ages the same—a simple circular stone, swiftly revolving on an axle. All nations use it; and it is perhaps, with all, the one piece of mechanism that bears the same form, and is the same in principle. More or less directly it takes part in the greatest modern material enterprises; it has, no doubt, assisted to fashion the implements of many of the lost arts, and is still needed in many of the requirements of arts of the present day.

As ages revolve and invention gives to the world new devices, may it be found more the agent in forming the plowshare and pruning hook, than in sharpening the sword.

WHERE GRINDSTONES COME FROM, AND HOW THEY ARE MADE.

The sandstone formation overlying the coal beds of England furnishes the grindstones of that the principal quarries being located at Newcastle-on-Tyne and at Wickersley. The quarries are worked by hand, and all the grindstones are made with mallet and chisel, and have been imported into this country for over 100 years. The grindstones from the provinces of Nova Scotia and New Brunswick are, also, the overlying sandstone formation of the coal district bordering on the Bay of Fundy and extending across the province to the Gulf of St. Lawrence. These immense deposits contain a great variety of grits, known as Nova Scotia grindstones. These quarries are generally worked by the French people, known as Acadians, from the name they gave this country, "Acadia," and are descendants of the Huguenots, who were driven out of France by

religious persecution. They are a very industrious and simple minded people, and the females retain to this day the style of dress brought over from France by their ancestors. The tides of the Bay of Fundy rise and fall from 60 to 70 feet every twelve hours, and these people avail themselves of this power to work the quarries, which extend from a high bluff on the mainland down to low water mark in the bay. At low water a huge mass of stone is loosened from its bed and a heavy chain is passed under it and over a large boat which is placed alongside. As the tide rises the stone attached to the bottom of the boat floated into a sand cove at high water, and made into a grindstone after the tide recedes. This is done with a mallet and chisel, the rough parts being first chopped off with a heavy axe. Machinery has been recently introduced, and the small grindstones are now turned in a lathe by steam-power. The sandstone deposits of this country which are made into grindstones are found along the shores of Lake Erie, and extending for a considerable distance east and west of Cleveland, and inland as far as Marietta, on the Ohio. They are also found on the shores of Lake Huron, above Detroit. These deposits are of a different character from the foreign stone, and do not seem to be the overlying strata of coal formations, but appear to be a later formation as the quarries look as though this part of Ohio had once been the bottom of the lake, the sand of which had become solid, and been upheaved by some convulsion of nature. Nearly all the Ohio grindstones are made by machinery driven by steam-power.

The blocks of stone being loosened from the quarry bed are roughly hewn out with a square hole in the center, they are then placed on a heavy square iron shaft furnished with a nine inch collar, against which the stone is securely fastened by means of another collar keyed against the stone. The shaft and stone being driven by steam-power, two men on opposite sides of the stone turn it off perfectly true by means of soft iron bars six feet long, two inches by one-half inch thick, which are drawn out to a thin point which is curved upward. This was formerly a very unhealthy operation, owing to the dust being inhaled by the workmen, but this difficulty is now obviated by means of blowers which drive it away.

USES OF THE GRINDSTONE.

There are specialties in mechanic arts which are the results of many years of practice, and in nothing more than in the varied and important uses to which grindstones are applied. Formerly their operations were confined to the sharpening of tools only, but this is now only a small part of the uses to which they are put, as it has been found by experience that almost every kind of steel, iron and brass work used in finished machines can be ground better and cheaper than by filing. Almost every part of a locomotive engine is now finished on the grindstone, which leaves the metal in the best possible condition to receive the polish or paint in finishing. The Baldwin Works, Philadelphia, keep six grindstones of 4000 pounds each running constantly on locomotive work alone, not only all the rough castings being ground, but 41 working parts of the engine are finished in this way, beside grinding off the faces of their anvils, some of them weighing 750 pounds. The master machinist of nearly all the railway repair shops find it to their interest to keep at least one grindstone in use for this purpose.

Grindstones are also used for finishing pulleys of all sizes. The pulley is caused to revolve against the stone, which runs rapidly in an opposite direction; this grinds down the face of the pulley very fast, and at less cost than turning it off in a lathe, beside leaving it perfectly true. It requires, however, a very peculiar grindstone for this purpose, the grit of which should be very sharp and firm, so as not to crush down with the necessary pressure, and yet not so hard as to glaze in usage. A peculiar kind of Newcastle grindstone has been found to meet these requirements, and should be used with water to prevent heating.

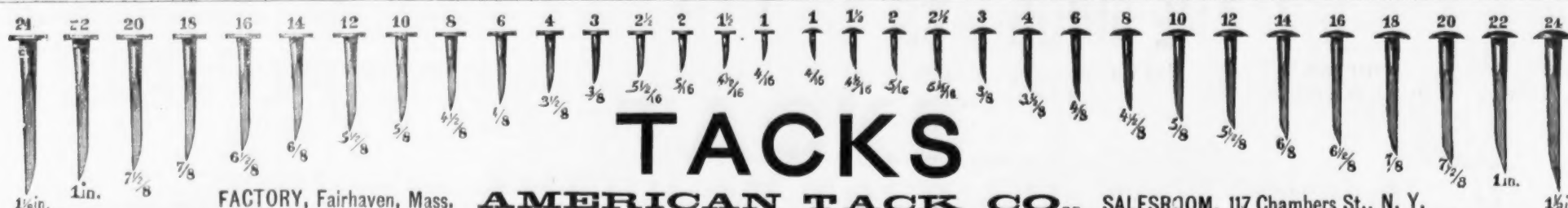
MACHINISTS' GRINDSTONES.

There is probably no implement in the machine shop or factory which pays better for the care bestowed on it than the grindstone, and when we consider that nearly every tool and all edge tools require its use, it is somewhat surprising that more attention has not been bestowed on the proper selection of the grit for the purposes intended. The writer has frequently observed in many machine shops that a good grindstone well hung and in perfect order was the exception rather than the rule. As grindstones in such places are almost constantly in use, their first cost is of little consequence if the quality is calculated to do the work required in the shortest time and most perfect manner, as more time can be wasted on a poor grindstone, badly hung and out of order, than will pay for a good one every three months. This state of things should not continue, as with the great improvements made in the manner of hanging them, and the endless variety of grits to select from, every machinist and manufacturer should have a grindstone which will not only do its work perfectly, but in the shortest time. This can be accomplished by sending a small sample of the grit wanted to the dealer to select by. Grindstones are frequently injured through the carelessness of those having them in charge. The machinist's grindstone will have a soft place in it caused by the loss of it being allowed to stand in water over night and the difficulty arising from this cause increases with every revolution of the stone; but as this homely implement is in charge of all men in the shop in general, and no one in particular, and as all the workmen are too busy to raise it down, double the time is consumed in imperfectly grinding a tool than would be required to grind it perfectly if the stone was kept in order by some one whose duty it should be to attend to keeping all the grindstones of the establishment in order. The wages of a man for this duty would be saved in the time and perfection with which the tools of a large establishment could be kept in order for work.

HINTS HOW TO USE A GRINDSTONE.

- 1st. Don't waste the stone by running it in water, nor allow it to stand in water when not in use, as this will cause a soft place.
- 2d. Wet the stone by dropping water on it from a pot suspended above the stone, and stop off the water when not in use.
- 3d. Don't allow the stone to get out of order, but keep it perfectly round by the use of a piece of gas pipe or a backer, or use a pair of the double hung stones, which keep each other in order.
- 4th. Clean off all greasy tools before sharpening, as grease or oil destroys the grit.
- 5th. Observe—When you get a stone that suits your purpose, send a sample of the grit to the dealer to select by; a half ounce sample is enough, and can be sent in a letter by mail.

(To be continued.)



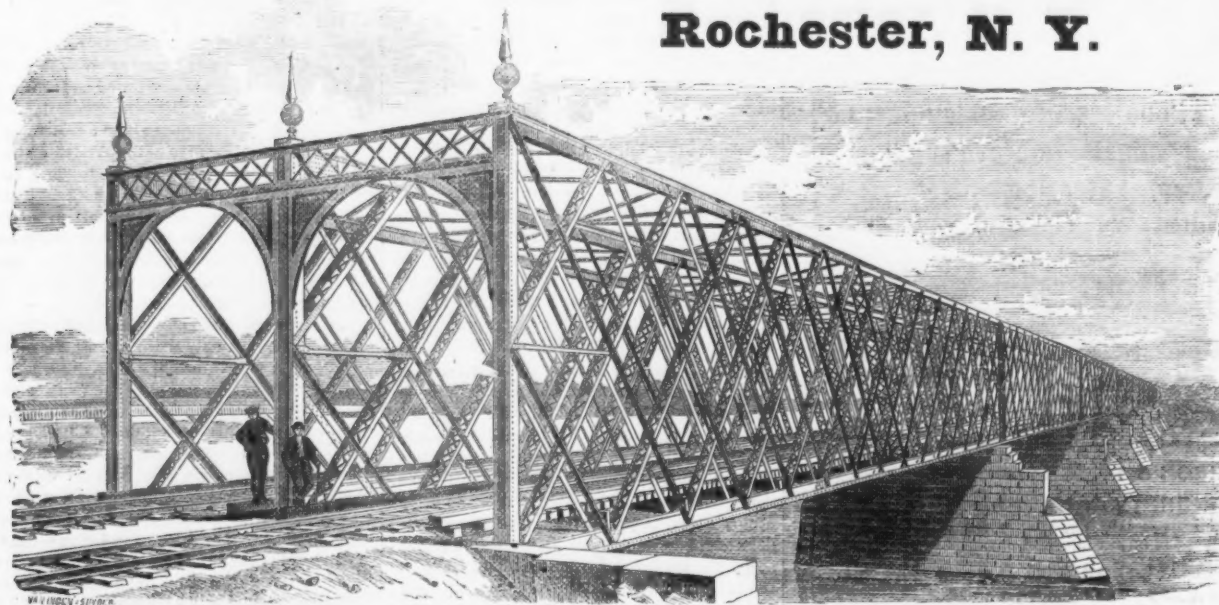
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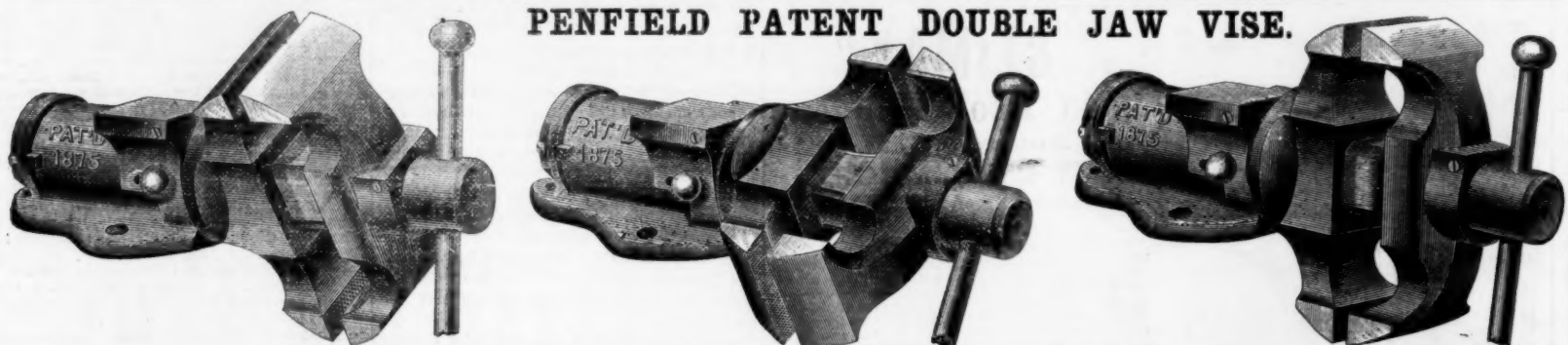
[Accompanying engraving represents the Springfield Bridge, built by the Leighton Bridge and Iron Works.]

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We call your attention to a new form of Patent Vise, possessing double jaws, which may be so adjusted as to hold an object at any desired angle with great firmness. This arrangement offers great advantages over any other Vise, as the operator can place his work at any angle best suited to his convenience. On the standard there is a spring bolt, which, when it is desired to adjust the jaws, is drawn back, and the jaws are set at any desired position. The face of one pair of jaws are roughened, and those of the other pair are smooth, to suit different kinds of work. The whole construction of the Vise is such as to prevent any chips or filings entering the working parts. Into the end of the standard is placed the finger nut, which is held in its position at the rear end of the standard by two steel screws holding it firmly in its place. Send for Circular and Price List. Manufactured by ELMORE PENFIELD, Middletown, Conn.

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4 inches.....each, \$4.75 | 6 inches.....each, \$5.50
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Each Lock is furnished with

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The Locks are fitted to the Keys and not the Keys to the Locks, and as no impression of the Lock can be taken, no false (or counterfeit) Keys can be made without the original Key to work from. The variation of one-fiftieth of an inch in any of the tumbler of the Lock from the position in which they are fitted, prevents the working of the Lock.

Each Lock contains forty tumblers, each having five false notches, which bear upon the Key at two different points and are worked without the aid of any springs.

All working parts of the Lock are made of fine brass, securely incased, and all bolts in the Locks are moved by an Eccentric, hence there are no springs to break or wear out. When extra Keys are desired, one of the original Keys must be returned, as we do not duplicate by number.

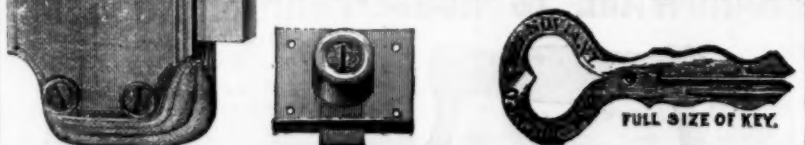
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- | Design. | No. of Plates. | VILLAS. |
|---------|----------------|--|
| 1 | 1 | Basement, 1st and 2d story plans of Frame Villa. Scale indicated on plate. |
| 2 | 2 | Perspective view. |
| 3 | 3 | Perspective view, Frame Villa House. Plans similar to Design No. 1. |
| 4 | 4 | 1st and 2d story plans of a Brick Villa. Scale indicated on plate. |
| 5 | 5 | Front elevation of Villa. Scale indicated on plate. |
| 6 | 6 | Perspective view. |
| 7 | 7 | Ground and 2d floor plans of Brick Villa. Scale indicated on plate. |
| 8 | 8 | Perspective view. |
| 9 | 9 | 1st and 2d floor plans of a Frame Villa. Scale indicated on plate. |
| 10 | 10 | Front elevation. |
| 11 | 11 | 1st and 2d story plans of a Frame Villa. |
| 12 | 12 | Perspective view. |
| 13 | 13 | 1st and 2d story plans of a Frame Villa. |
| 14 | 14 | Front elevation. |
| 15 | 15 | Perspective view of a Villa. Plans similar to Design 7. |
| 16 | 16 | 1st and 2d story plans of Brick Villa. Scale indicated on plate. |
| 17 | 17 | Perspective view. |
| 18 | 18 | 1st and 2d story plans of a Brick Villa. Scale indicated on plate. |
| 19 | 19 | Perspective view. |
| 20 | 20 | Perspective view of Brick Villa. Plans similar to Design 10. |
| 21 | 21 | 1st and 2d story plans of Frame Villa. Scale indicated on plate. |
| 22 | 22 | Perspective view. |

COTTAGES.

- | | | |
|----|----|--|
| 1 | 23 | 1st and 2d story plans of a Frame Cottage. Scale indicated on plate. |
| 2 | 24 | Perspective view. |
| 3 | 25 | Perspective view of a Frame cottage. Plans same as Design 13. |
| 4 | 26 | 1st and 2d story plans of a Frame Cottage. Scale indicated on plate. |
| 5 | 27 | Front elevation. |
| 6 | 28 | Perspective view. |
| 7 | 29 | 1st and 2d story plans of a Frame Cottage. Scale indicated on plate. |
| 8 | 30 | Perspective view. |
| 9 | 31 | 1st and 2d story plans of a Brick Cottage. Scale indicated on plate. |
| 10 | 32 | Perspective view. |
| 11 | 33 | 1st and 2d story plans of a Brick Cottage. Scale indicated on plate. |
| 12 | 34 | Perspective view. |
| 13 | 35 | 1st and 2d story plans of a Frame Cottage. Scale indicated on plate. |
| 14 | 36 | Perspective view. |
| 15 | 37 | Perspective view of Cottage. Plans similar to Design 7. |
| 16 | 38 | Perspective view of Cottage. Plans similar to Design 7. |
| 17 | 39 | 1st and 2d story plans of a Brick and Frame Cottage. Scale indicated on plate. |
| 18 | 40 | Perspective view. |

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B4*ANY

BUSINESS ITEMS.

NEW YORK.

The merchant and rail mills at Rome are running steadily.

PENNSYLVANIA.

The Little Schuylkill Rolling Mill, above Port Clinton, made last week 77,592 pounds, or 34 tons 1432 pounds 7-16 inch square iron. The smallest amount made in any one day was on Saturday—4 tons 944 pounds. On Thursday they made 16,400 pounds, or 7 tons 720 pounds. While this was being done by the day shift, the night shift made during the week 27 tons 92 pounds billets. Considering the time of the year and the size of the iron, this is a very heavy yield from one heating furnace.

The new tube works at Fern Dale have been named the "Standard Tube Works," and are expected to be ready for turning out pipes in September or October next.

The Emaus Furnace is advertised to be sold on July 18th, by order of the Fidelity Trust and Safe Deposit Company, of Philadelphia.

The Allentown Herald is authority for saying that the Friedensville zinc mines are to be closed on account of the great expense of mining the ore, when it can be purchased from other parties for less money. Thus the largest pumping engine in the United States will not be employed.

The Baldwin Locomotive Works, at Philadelphia, are now delivering 17 engines to the Delaware, Lackawanna and Western Railroad. Two of these are 18 by 24 in. cylinder consolidation engines, and 10 are Mogul pattern, with 18 by 24 in. cylinders. The consolidation engines are substantially like the one built for the Lehigh Valley Road, and now on exhibition at the Centennial. An order for 10 wheel engines for the Lehigh Valley Railroad is also in progress.—Lehigh Register.

Messrs. Noblit & Bro., Tioga Rolling Mills, Germantown, who have heretofore done no puddling, have just put in a furnace, and will begin working pig immediately.

PITTSBURGH AND VICINITY.

The glass manufacturers have carried out their intention, and every furnace but one is now idle.

But little work, comparatively, will be done at the rolling mills in this neighborhood for the next four weeks. Some will be stopped for annual repairs, and others to take stock. Some of the largest mills have as yet refused to sign the boilers' scale, and some that have done so are working only half time.

The Pittsburgh Exposition will open the 16th of August.

The Rochester Tumbler Works have a weekly capacity of 200,000 tumblers. They use natural gas in their manufacture, and ship their wares largely to the Gulf and South American States.

Bakewell, Page & Co. have been manufacturing glassware for 68 years. Fifty years ago they made Lafayette a present, and got the following reply:

PITTSBURGH, May 31, 1824.

GENTLEMEN—The patriotic gratification I have felt at the sight of your beautiful manufacture is still enhanced by the friendly reception I have met from you, and by the most acceptable present you were pleased to offer me. Accept my affectionate thanks, good wishes and regards.

LAFAYETTE.

Mrs. (sic) Bakewell, Page & Bakewell, Pittsburgh.

WEST VIRGINIA.

The South Wheeling Glass Works have just completed an order for a set of ware left by Miss Maggie Mitchell at her last visit to that city.

OHIO.

The experiment of using charcoal furnaces for the manufacture of iron with stone-coal, without any change of machinery, hearth and inwall, has so far not been very successful. While some furnaces have, for a little time, done well, others have chilled and scaffolded, and been obliged to blow out.

The Belfort Furnace has stopped until there is a sufficient rise in the river to get a stock of ore.

The Alice Furnace seems to be doing better since it abandoned the self-coking system. They are shipping their iron as fast as made.

The Canton Wrought Iron Bridge Company have just been awarded contracts for seven of their bridges by the Commissioners of Allegheny county, Pittsburgh. The bridges average from 40 to 50 feet span.

The Enterprise Machine Co., Cleveland, are running 12 hours a day on machinists' tools and turning car axles for the C., C. & I. Railroad.

Cleveland is erecting a liberty pole of Bessemer steel.

The managers of the Russia Mill, at Niles, owing to an increased demand for their productions, contemplate putting on another set of workmen in their sheet mills, thus running three turns, each turn working eight hours. They have been erecting several nail machines for some time past, two of which were put in operation Tuesday. The rest will be started as soon as they are ready.

Both of Cartwright, McCurdy & Co.'s mills, at Youngstown, are running double turn.

Brown, Bonnell & Co., Youngstown, have signed the sliding scale, and their puddlers have gone to work double turn, three heats to the turn.

All the mills at Youngstown have signed the sliding scale, and the five mills are now in operation.

Miller, Jamieson & Co. are at present building an iron bridge for Cuyahoga county, a Pratt truss bridge for Knox county, and received orders last week for ten boilers; one 54 inch shell, one 64 inch shell, four 10 horse and two 25 portables and two 20 horse-power boilers.

The following Hanging Rock furnace news is gathered from the Ironton Journal: The Lawrence mill went on with a full force Monday morning. Alice is running on

native ore and coke, making the best of iron. The Iron and Steel Company have one ore kiln in West Ironton, undergoing the process of roasting. Furnacemen in this region are having trouble getting Missouri ore. The Atna has had an order in for several months and cannot have it filled. The Sheridan Mining Company are now making coke. The specimens brought to town show that it is of excellent quality.

The Girard Furnace is in blast, the rolling mill running full capacity, and the stove works are active.

The Cleveland Nut and Bolt Works are turning out some 50,000 nuts and bolts per day.

Mr. Thomas I. Murdock has been elected president of the Iron and Steel Company, Ironton, in the place of Mr. Robert Scott, resigned.

KENTUCKY.

The Louisville Plate Glass Works will be ready to go in full blast in about 10 days or two weeks, with a capacity three times as great as heretofore. Seven large steam engines and other ponderous accessories have been added. The director general of the oldest and largest plate glass works in France has recently paid the Louisville works a visit, and pronounces them first-class, and far beyond his expectation.

ILLINOIS.

We take the following from the Rock Island Daily Union: The Union Malleable Iron Company intends to commence in a week or so to reconstruct its present building and put up many valuable additions suited to its trade. The foundry will be placed on the north end of the lot close by the river. The front of the entire shop will be built two stories high, with galvanized iron cornice and window caps, extending back 50 feet. Beyond that will be the one story workshops—finishing shop and foundry. The buildings when complete will consist of an office 30x20, with a private office 8x14, a pattern vault 12x40; store room 40x40; finishing shop 50x50; annealing room 50x100; pattern room 40x40; foundry 117x60. An extra set of new annealing ovens will be put in of the latest designs. The old ones will also be kept in order and ready for use in case of any mishap occurring to the new ones, or both can be used in case of a rush of orders. This company is meeting with great success. C. S. Ellis is president; C. W. Heald, vice-president; and H. O. Sleight, secretary and treasurer.

MICHIGAN.

The Herald, Negaunee, says: The Iron Cliffs Company is running both stacks of the Pioneer Furnace steadily, having plenty of stock on hand, and are doing excellent work. Nearly all the iron turned out is No. 1, of the best quality, and we presume neither stack will be blown out during the summer.

The Rolling Mill mine is taking out and shipping on an average 400 tons of ore per day. One hundred men are employed in these mines.

One hundred additional men have been set to work in the Republic Mine making the full force fully three hundred and fifty. Large quantities of ore are being shipped from these mines.

The New Burt Mine is being worked with 50 men, and from 60 to 100 tons of ore is being raised daily.

The May product of the Calumet and Hecla mines was 1230 tons, 710 lbs. The Osceola produced 100 tons.

The Munising Furnace, Marquette, is receiving a new hearth and will be blown in at an early day—about the 15th inst.

The Marquette Mining Journal of the 17th ult. says: The Carp Furnace was relit this week, and commenced making iron on Wednesday, the 14th ult., working nicely until about 4 o'clock, p. m. the following day, when the arch of the hot blast fell in, which necessitated a stoppage of about thirty-six hours.

The Bancroft Furnace has blown out, having used up all its stock.

TENNESSEE.

The experiment of making steel at Kingston has been thus far entirely successful. It is made from pig iron direct into puddled steel, and then refined in crucibles, under a patent granted Mr. John Leighton by the United States government. The result thus far has been a production that is spoken of in the highest terms by the manufacturers of cutlery. The capacity of the works is now but about 1000 pounds per day, but the whole thing is in the hands of some of the wealthiest men of East Tennessee, who are simply biding their time to develop it to a first-class manufacturing establishment.

Owing to the disabling of the engine, operations are temporarily suspended at the Roane Iron Company's rail mill. Work will be resumed as soon as the engine is repaired.

Flexible Shaft for Transmitting Power.

An important and interesting mechanical novelty in Machinery Hall is an exhibit of Stow's patent flexible shaft and tools, located in section D, column 68. The leading idea of this important invention was patented in August, 1872, since which time it has been extensively and successfully applied to dental purposes, as well as to wood carving, to drilling rocks, cleaning castings, cleaning boilers, etc.

It is applicable to many purposes, one of the most important being the removal of flues from locomotive boilers, and the performance of other classes of work in railway repair shops. The exhibitors, Stow & Burnham, have opened an office and factory at No. 500 North Fifteenth street, Philadelphia, where they now manufacture cables or flexible shafts for the communication of power, and appropriate tools for a variety of work. The flexible shaft is composed of iron or steel wire closely coiled back and forth until the desired diameter is attained; it is then inclosed in a case also composed of a coil of wire and covered with leather. By its construction the shaft possesses a high torsional and a low bending resistance. In other words, if power be applied at one end, by a pulley suitably attached, it will be communicated to the other as surely as if the shaft was rigid, while at the same time its flexibility allows it to be turned in any direction. The great advantage of this device is that the power may be carried to the work instead of the work to the power. Thus the numerous holes necessarily drilled in a boiler after it has been put together and can no longer be carried to the drill press and punching machine, may now be drilled by power. In fact the flexible shaft largely increases the sphere of action of the steam engine, leading it into the minute and intricate paths hitherto reached only by hand-power. Each shaft is fitted with a pulley at one end, and, if desired, a clutch at the other, by which the tool may be connected or disconnected without stopping the machine.

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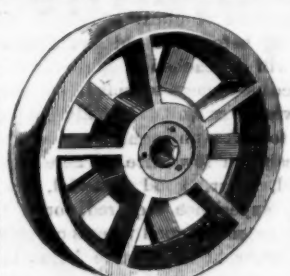
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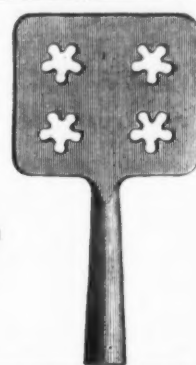
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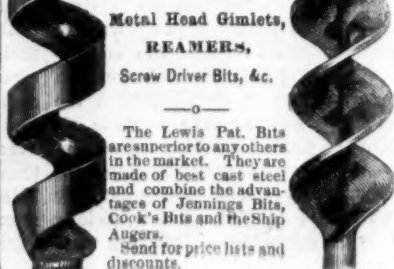
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THOS. HOBSON, Manager.

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CONTENTS.

First Page.—Single Spindle Foot Drill. American Institute of Mining Engineers.

Third Page.—Conditions of Excellence in Plumbing Work.

Fifth Page.—New Patents. An Important Decision in a Stove Patent Suit. The Heavy Guns.

Seventh Page.—The Sewage Systems of Large Cities.

Ninth Page.—Grindstones.

Eleventh Page.—Business Items. Flexible Shaft for Transmitting Power.

Fourteenth Page.—Are We Suffering from Overproduction? The Price of Stoves. Tin Plates. Guaranteeing Car Wheel Mileages.

Fifteenth Page.—Guaranteeing Car Wheel Mileages.—(Continued). Canadian Stoves at the Centennial. The Beginnings of the Iron Industry at Pittsburgh. The Officers of Machinery Hall, Centennial Exhibition.

Sixteenth Page.—Hardware at the Centennial. Mining and Metallurgy at the International Exhibition.

Eighteenth Page.—Some American Irons. The Origin and Progress of Industrial Exhibitions.

Twentieth Page.—The "Summer Queen." Petroleum Cook Stove. Bursting of a Water Tank in an English Hospital.

Twenty-first Page.—Trade Report.

Twenty-second Page.—Trade Report.—(Continued).

Twenty-third Page.—Our English Letter.

Twenty-fourth Page.—Stove Exhibits at the Centennial. The Water Supply of New York.

Twenty-fifth Page.—The Iron Age Directory.

Thirtieth Page.—New York Wholesale Prices of Hardware and Metals.

Thirty-first Page.—New York Wholesale Prices.—(Continued).

Thirty-fifth Page.—Philadelphia, Buffalo, Cincinnati, Pittsburgh and Detroit Hardware and Metal Prices.

Thirty-seventh Page.—Chicago, Boston, and St. Louis Hardware and Metal Prices.

Are We Suffering from Overproduction?

It is of the utmost importance in the discussion of a subject, that we should avoid calling things by wrong names. Such a misuse of terms confuses people's ideas, and usually sets them thinking in wrong directions, only to arrive at last at mistaken conclusions. We find an instance of this in the constant and very general misuse of the word "overproduction." It is an easy word to pronounce, it sounds well and is very comprehensive—reasons, probably, why it is so generally employed. If the question is asked, "Why are our 'productive industries so unprofitable, and 'our distributive industries so sluggish?" the easy and natural answer seems to be "overproduction." We hear on all sides that the enormous expansion of our productive industries has given us a capacity for production in excess of our consumptive requirements. People tell us that by the aid of steam-power and machinery we are able to make so much more than the world needs, that we cannot expect prosperity again until an increase of population shall have increased consumptive capacity. In a word, we are told by everybody who has any opinions to ventilate that the cause of our present trouble is "overproduction."

Now, is there any foundation in fact

for the assumption that our accumulation and production of useful commodities exceeds our requirements? We do not think there is. Trouble, so far as useful commodities of all kinds are concerned, is not with production but with consumption. Our manufacturing capacity has increased very little, if any, since 1872. Certainly our production is less now than in that year, and yet no one then complained of overproduction. All classes of the people gloried in the development of our manufacturing industries, and newspaper writers found in the extent and variety of our production a congenial theme upon which to dilate when topics were scarce. Suddenly, from causes which need not be specified, we witnessed a great shrinkage in the consumptive requirements of the country. Manufacturers began to accumulate, manufacturers were forced to reduce production, and, in some instances, to stop, and the evidences of a partial paralysis were seen in all departments of industry. This was not due to an increased production, nor to a large accumulation of goods on the market. On the contrary, it grew more and more severe as production shrunk and accumulations of stocks were worked down. Now, it is evident that the country consumed more of useful commodities in 1872 than it needed, or that the people are now consuming less than they need. Which, in the judgment of the intelligent reader, is the more probable?

Presented in this shape, we fail to see how any one can escape the conclusion that the trouble is, as we have already said, not with production but with consumption. When everything was prosperous and business was good, no one ate more than he wanted, no one wore more cotton or woolen cloth, more hats or boots than his convenience and comfort demanded, and no one bought anything useful merely for the sake of buying it. There were necessities, wants or desires to account for the most liberal consumption we have ever witnessed. We are justified, then, in concluding that the only reason we now have a supply of useful commodities beyond the present requirements of distributive trade, is that the people of the country are not now providing for their necessities, supplying their wants or gratifying their desires as fully as in 1872. Evidently, this economy of consumption is not voluntary. Circumstances have compelled it, and, in many instances, extreme poverty has enforced it. The working classes are economizing to a greater extent than they have found necessary at any time since the bad years which followed the panic of 1857. The middle classes are economizing because salaries have been cut down, incomes have shrunk, and business of all kinds is less profitable than formerly; the so-called wealthy classes are economizing because real estate has fallen, rents have declined, and taxes and assessments leave of the income from real estate a very narrow margin of interest. In New York there are thousands scantily fed from the hand of charity. Throughout the country there are millions who are planning and contriving to make one dollar do what, in more prosperous times, would scarce be expected of ten. A gentleman now in this city as a delegate to the National Board of Trade from a district containing a very large working population, tells us that thousands of families in the State from which he comes are living on potatoes and salt, and a scanty supply of these. And so we might go on until we had filled the page. Does any one suppose that the people of the country would not consume a great deal more than they do if they had anything to give in exchange for the useful commodities they want that manufacturers and merchants were willing to take? If so, let him, if he be a merchant, offer to exchange food and clothing for days' work, and he will see his mistake.

It requires little argument to convince the intelligent man that universal abundance is the end and aim of all human effort. The condition of greatest earthly good of which the human mind can conceive, is one in which it were within the power of all classes of the people to gratify all right and reasonable desires. When that condition is reached throughout the world, we shall have attained the point at which overproduction will become possible. But we have not reached it yet, nor should we in centuries if a more rapid increase of useful production than the world has witnessed in this or any previous age.

What, then, is the trouble from which we are now suffering? The answer, we think, is easily found. Capital, always selfish and always timid, is not giving labor employment. We will even go so far as to say that, if every manufacturing and other large industry could be suddenly quickened into the greatest activity which steam-power, machinery and all the

appliances of civilized labor, has rendered possible, we should as suddenly see an end of hard times, and, instead of overproduction, we should find room in our markets for a vast aggregate value of imported products. In our judgment, the only remedy for the condition of affairs of which we hear so much complaint, lies in the success of well directed efforts to give employment to the idle labor of the country. This may seem an impracticable remedy, and so it is, so far as the individual reader is concerned, but if every man in his sphere, whether it be large or small, would do all in his power to set in motion the wheels of industry by giving employment to all the labor he could make use of, even though without immediate profit to himself, a new life would thrill through the sluggish pulses of trade, the clouds would disappear, and in three months the "hard times following the panic of 1873," would be remembered only as one remembrance in the morning a troubled dream of the night.

The Price of Stoves.

A correspondent in the stove business sends us the following sensible communication, which, we hope, will receive the attention of all who are interested in the subject of which it treats:

To the Editor of *The Iron Age*: I always read with interest the articles in your valuable paper on the subject of prices of stoves, and the manner of doing business by the dealer, and also the deliverances and addresses of the National Association of Stove Manufacturers at their meetings from time to time. There is a manifest dissatisfaction on the part of the dealer about the prices at which manufacturers sell, and their consequent profits on stoves. There is also an evident uneasiness on the part of the manufacturers, as they express themselves at their semi-annual meetings, about their balance sheets for the past year. Fraternal feelings expressed at business meetings, and a scale of prices recommended by the members of the Association as the natural outgrowth of the kindly feelings, is one thing; but when the members disband, and go out into the field of operation to make sales of their stoves, regardless of such expressions and recommendations, it is quite another thing in the practical working. And hence the legitimate complaint of dealers about manufacturers, and the small profits as shown by the balance sheets of manufacturers themselves.

It would seem to the uninitiated that manufacturers all know about what is meant by first-class, second-class and common stoves, and when the price is recommended to be for common stoves, six and a half cents per pound, that that would be the approximate price of that class of stoves; but when the salesman strikes out on the road and makes sales at prices ranging from 4c. to 6½c. per pound for common stoves, with a standing banter along the route that he can and will sell a little lower than any other house, the natural result is that the next salesman will shade him, if the dealer is shrewd enough to read his man. Then, as a consequence, dealer A buys a little lower than dealer B in the same or contiguous towns, owing to the astuteness of the buyer and the strength of the banter laid out by competitive salesmen. Now, would it not be better for the manufacturers to practically live up to the scale of prices as recommended by the Association, thereby making a better profit, and giving, at the same time, greater satisfaction to the dealer, because then he knows he is buying his stoves as cheaply as his neighbor.

Another source of trouble between manufacturer and dealer is, that some manufacturers always have some obsolete patterns that they are offering to close out to dealers at greatly reduced rates, and every year they have about the same number of them. Others, in order to remove stoves from a certain warehouse, offer great inducements in low prices until the stock in that warehouse is cleared; but it so happens that the stock of stoves in that warehouse is like the widow's cruse of oil—the more taken out the more left; hence, keeping up a continual friction between manufacturers, and a corresponding dissatisfaction between manufacturers and dealers.

If the theory be correct that there is overproduction in stoves, does it not seem like folly to continue to make as many stoves as before, and sell them at a lower price, which many manufacturers do now?

The better way to undertake would be to maintain a fair price, and not make as many stoves; because when stoves are reduced in price it is hard work to get the price up again to its former standing. It is just as hard work for the dealer to raise the price after having cut under, as it is for the manufacturer to put up the price after having reduced it, from whatever cause. If the manufacturers would maintain a fair and uniform price, it would be all the better for the dealer, for the inducements would not be so great to the dealer to cut on prices. If stoves were sold at the scale of prices recommended by the Manufacturers' Association, there would be less complaint of small profits, as shown by balance sheets, and much greater harmony between manufacturers and dealers, and also between dealers themselves.

How would it do to try the experiment for the coming fall trade? Let us hear from others—dealers and manufacturers. Yours truly, H.

This communication calls for no comment from us. We have no doubt that the complaints of our correspondent are well founded, and that the remedy he suggests for the evils from which the trade is suffering is perfectly practicable. The only course open to the prudent founder is to make no more stoves than he has reasonable assurance of being able to sell. Some of the largest and best-managed foundries of which we know, are running only about two-thirds of their capacity, and still are making all the stoves they are likely to sell between this and spring. Those who adopt a different policy will, we fear, have to choose between the alternatives of carrying a large stock over into next year, or force their product on the market at prices so low as to preclude all possibility of profit. So long as the manufacturers continue the policy of getting out as many new stoves, and making as many changes in old ones, as possible, so long will they be compelled to sacrifice their

old styles, and the wedge thus entered is very apt to be driven by traveling salesmen until it splits up the profits on a large proportion of the new styles sold.

All things considered, we regard the situation in the stove trade as very critical. Four-fifths of all that represents the capital invested in this business would not probably be worth five cents on the dollar at forced sale, and never will be. The business is passing through a transition period in which great changes are inevitable, and the policy of the manufacturer is to be prudent and cautious in all things. He had better make nothing which he cannot sell at a fair living profit, and would consult his best interests by showing very little of the kind of "enterprise" which our correspondent describes. We hope to hear from others on this and kindred subjects. The dealers, with their suggestions and these demands, have led the manufacturers a wild race for some years past. If they can now point the way back to a safe and solid basis, favorable alike to those who make and those who sell stoves, they will thereby undo something of the mischief they have done in encouraging so wide a departure from a safe basis.

In our judgment, the trade is suffering from an overdose of "frills," and when the dealers are tired of these there will be some chance of a return to plain goods and standard styles. There will always be a limited demand for the very best and most elegant goods which can be made; but no one is benefited when the manufacturer bankrupts himself trying to make second-class stoves look like first-class, and then selling them at third-class prices.

Tin Plates.

About two months ago, when tin plates declined to an average of 25 per cent. below their value in July, 1874, it was supposed that they had reached a point from which a further decline was impossible. This supposition was reasonable enough, but expectations of a recovery were disappointed, and the decline continued until prices averaged about 20 per cent. below those of two years ago, as will be seen from the following comparison:

	1875, July 1.	1874, July 1.
Ordinary brands. Gold per box.	\$6.75 to \$7.00	\$10.25 to \$10.50
Charcoal Bright. \$6.75 to \$7.00	9.00 to 9.50	12.00 to 12.50
"Ternes." 6.75 to 7.00	8.00 to 8.25	10.00 to 10.50
Coke Tin..... 6.00	7.00 to 7.25	9.00 to 9.50
"Ternes." 5.50		7.00 to 7.25

Average..... \$6.20 \$8.71

Up to the beginning of the current year, shipments of tin plates to the United States were steadily on the increase, as will appear from the following comparative statistics of importations:

	Boxes.
1873.....	1,531,336
1874.....	1,511,632
1875.....	1,585,994
1876.....	1,673,435

This year, up to the present time, there has been a decrease of about 18 per cent., as compared with last year. The receipts at New York since January 1st have been 413,375 boxes, against 495,767 from January 1st to July 24th, 1875. The exports of tin plates from Great Britain to all countries in 1875 was 138,563 tons, against 122,960 tons in 1874, and 120,638 tons in 1873. For the first quarter of 1876 the British exports to all countries were 30,960 tons, against 37,242 and 34,872 tons for the corresponding periods of 1875 and 1874 respectively. These large shipments have overstocked the dull markets of this and other consuming countries, thus bringing about the decline in prices which has forced a curtailment of production in Great Britain. The evil has thus worked out its own cure, and tin plates are now in a fair way to recover—at least to an extent which will make production moderately profitable. As compared with the average of the past few years, however, they are likely to be cheap for some time to come. Iron, block tin, coal and labor have all declined considerably during the past three years.

It must be remembered, however, that the causes above noted have been operating to effect important changes in the tin plate market. The effect of a diminished production and a diminished export will probably be felt first in a sudden scarcity of certain kinds of plates, and finally by a growing anxiety on the part of dealers in the interior to replenish stocks in anticipation of an improved demand during the autumn.

Statistically, there is no article in the metal trade that we know of so easily understood and followed up as tin plates, and both in England and here these tables are kept with the utmost accuracy. Any palpable excess will soon be known, and dealers and consumers will do well to check their operations from the moment they are aware that unusually large shipments are actually made to this country. In former years speculation came to the relief of an over-supplied market, and any excess was thus disposed of for a time; but under existing conditions the less we trust in an artificial demand the better we are off. We have learned some severe lessons since 1873,

and we are not likely soon to forget them. Any sustained improvement in the value of plates will probably have for its basis an improvement in the legitimate consumptive demand, and that will not come until there is an increased activity in the industries which consume plates most largely.

Guaranteeing Car Wheel Mileages.

In a recent editorial upon car wheels, we mentioned the fact that some of the best manufacturers were willing to sell car wheels with the guaranty that they will run 50,000 miles, and agreeing to replace those that fail to come up to this standard. Since that time we have had occasion to investigate, somewhat carefully, the methods of purchase, and the contracts which roads are making, and we find that some of them, while requiring the guaranty, are buying on such terms as to make it almost impossible for them to obtain good wheels. One of the roads of which we speak has been paying a fraction over \$17—if we are not mistaken, it was \$17.25. At the same time they have been selling old wheels to the same parties at \$2.75 above the market price. The wheels were guaranteed for 60,000 miles average service. Taking into account the fact that the wheels were broad tread, and that they had to run over the 4 ft. 8½ in. and 4 ft. 9 in., and perhaps, 4 ft. 10 in. gauges, with no allowances for wheels destroyed by guard rails, etc., this was a contract very favorable to the railroad company. In spite of such a contract as this, however, the managers came to the conclusion that better terms were possible, and a contract was concluded with a firm to furnish wheels at a little less than \$13, but with a guaranty of 60,000 miles service for each and every wheel, replacing all that failed to make it. To the new parties the old wheels were also sold at an advance of about \$3 per ton above the market price. On the face of it, this looks like a fair business transaction and a good speculation for the company, but we do not think it a safe one. The founders are selling wheels for less than the cost of manufacture. Even supposing a common iron is used, they must cost about \$15.50. The freights in both directions are heavy—distances being considerable—and at the same time the price realized for old wheels is too great. The firm who make these wheels are, to all intents and purposes, insolvent, having no capital nor assets, and some \$90,000 of liabilities. The argument of the road is: If we can get a good wheel it makes no difference to us whether we pay less than it costs or not, and there can be no great loss, since every wheel is warranted. This is not sound reasoning. It is not economy to put under cars poor wheels which must be soon taken out, even though they cost nothing. The cost of replacing and the delay of the rolling stock make such wheels costly. Secondly, in the cases which have come to our notice, the firms have little or no knowledge of wheel making, and we fear their products are not to be trusted. Wheels do not commonly give out suddenly, yet, under such a system of manufacture, we have no means of assuring ourselves that they will not do so. Thirdly, the guarantee is by no means certain to give good wheels. If they are sold for less than cost, it will not trouble the manufacturers much to supply new wheels in the place of those that fail. The money comes from those who float the concern, and not from those who are immediately connected with the business. They are really spending capital and making no money. Responsible men cannot compete with such concerns, and it is merely a question of time for the roads to be swindled. We know that some of these firms do, at times, buy the very best charcoal wheel irons, but at others they take iron not fit to run in wheels even for gravel trains. The continuance of such firms in business would, in the course of a few years, put car wheel manufacture back to where it was in 1864, when, upon a single road which we could name, 50 wheels broke under passenger coaches, and in another part of the country one road broke 300 in freight service. The question now is not so much safety as wear, for we find only 25 or 30 broken wheels reported in a year for the whole United States. If we go on encouraging the manufacture of cheap wheels, it will not be long before the old averages of breakage will be reached. A good wheel not only costs money to make, but skill and knowledge as well. Nobody has yet been able to make uniformly good and reliable wheels at a low price. There is too much skill, labor, good material, and, above all, experience required, for it to be possible to make good wheels cheaply. If wheels are sold at a price below the cost of manufacture, it shows that something is wrong, and it behoves a railroad to inquire into the matter thoroughly before purchasing.

The establishments running upon the basis which we have named, have done much to prevent improvements in wheel manufacture, and yet the roads patronize them while complaining that wheels are not so good now as they used to be. In the matter of wheel buying, railroads, as the rule, seem to act in a most unwise manner. The wheel maker is compelled to take an old wheel for a new one, often at a price above the market value, and though he takes old wheels, he is not expected to use more than a very small fraction of them in the new wheels he makes. If he gives a guarantee of mileage he is charged with wheels broken by bad frogs, by guard rails and the like, all faults of the road and not of the wheel. Under these circumstances, the railroads expect good wheels, and complain bitterly because they do not get them, and, perhaps, handicap the manufacturers in the manner we mentioned in the beginning of this article. The absurdity of such a course, and the impossibility of obtaining a good article in such a manner, will in any other branch of business be at once recognized, but here people do not think, or do not, perhaps, comprehend the situation.

It seems to us that by far the best plan for obtaining a good wheel would be to rely solely upon mileage made. Take, say, 50,000 miles as the fair average life of a wheel for the purpose of determining price. The cost of such a wheel is, say, \$17. When worn out, it is worth, say \$5, making the cost to the road of 50,000 miles service, \$12, or say 25 cents per 1000 miles. When a road buys a wheel it pays \$17. When the wheel is worn out it is replaced. Meantime the actual number of miles which the wheel has run have been kept, not estimated. In buying a new wheel the company pays for it 25 cents per 1000 miles made by the old wheel. Thus, if the old wheel were out after a thousand miles run, the new wheel costs but 25 cents, while if the mileage of the old wheel was 100,000 miles, the new wheel would cost \$25. The larger mileage a wheel made the more it would cost, and the more it would be worth to the company, not only in safety, but also in the saving of time and expense in putting on new wheels. A system of buying which shall make the price of the wheel depend upon its service, would be of the greatest value, as it would give the wheel maker, not only an incentive to make the best wheel he could, but also the opportunity to do so, since, if he succeeded, he would receive pay for it, while at present he gets the same money for a wheel that makes 50,000 miles and one that makes 200,000. Manifestly the latter is worth more than four times as much as the former.

In regard to establishments like those mentioned, which are vainly attempting to float themselves by spending capital and selling a poor product at less than the cost of manufacture, we have a few words to say. They are destroying a legitimate business, wasting capital, turning out poor wheels, and are without any hope of doing better hereafter. Every responsible maker in the country knows of such firms, and knows how utterly impossible it is to compete with them. That railway managers should have anything to do with them is surprising. The end is always a loss of money by the company, while the trouble which is brought upon the community extends over years.

Canadian Stores at the Centennial.

We have the following letter from Messrs. Perry & Co., with regard to the Argand base burners exhibited at the Centennial by Messrs. Copp Bros., of Hamilton, Ontario:

To the Editor of *The Iron Age*.—DEAR SIR: Your remarks in *The Iron Age* of the 23d inst., would very justly apply to many of the stove founders of Canada, but not to the Messrs. Copp. They purchased from us patterns for the manufacture of the Argand base burners, as they have also many other patterns, and honorably paid for the same. We have abundant reason to complain of the great injustice practiced toward us by many of the Canadian manufacturers in filing up our best stoves for patterns, and using them without our consent, or payment therefor. In this respect, the Messrs. Copp are guiltless. We know them well, and it gives us pleasure to say that, for intelligence and honorable dealing, they can rank with the best.

Respectfully, yours,
PERRY & CO.

ALBANY, JUNE 26, 1876.

We are glad to give publicity to this communication. We had no desire to do any injustice to Messrs. Copp, but the fact of their showing reproductions of five sizes of the Argand was instanced in some remarks by an Albany founder at the last meeting of the National Association, as a flagrant instance of double refined impudence; and as no representative of Messrs. Perry & Co. was at the meeting, no explanation to the effect that the patterns had been purchased was offered. We cannot, however, make any further retraction of what we said before. We know more than one manufacturer who complained that among these same exhibits from Can-

ada were stoves made from stolen patterns, and one large manufacturer complained bitterly to us of the course of Messrs. Copp in appropriating patterns for which he had paid, and putting them on the Canadian market before they were generally introduced in the United States. We have no desire to do Messrs. Copp, or any other Canadian founders, injustice. We concede that they violate no statute in availing themselves of the labor, ingenuity, taste and capital of American stove manufacturers. They may even insist that they do no moral wrong in seizing an advantage which their laws permit them to enjoy, while denying to American manufacturers protection for their property rights in patterns in Canada. These questions we will not discuss; but there seems to us no question as to the kind of taste displayed by the Canadian founders in placing stoves made from stolen patterns in our Centennial Exhibition as Canadian products.

The Beginnings of the Iron Industry at Pittsburgh.

A correspondent, writing from Pittsburgh under date of June 28th, sends us the following interesting facts concerning the beginnings of iron manufacture in that city:

The first rolling mill in the United States for rolling bar iron was commenced in 1816, and got in operation about September of 1817. It was on Redstone Creek, about midway between Connelville and Brownsville, at a place called Middletown, better known as Plumcock, Fayette county, Pa. The property belonged to Mr. Isaac Mason, senior, of Dunbar Furnace. Mr. Thomas C. Lewis (my father) was chief engineer in the erection of the mill. George Lewis, his brother, was turner and roller. At the time, putting up that mill was no small job. It was difficult to get pattern makers and molders for machinery work, so that the most of the work fell on Mr. Lewis, as he was a practical as well as a theoretical mechanic. A better workman never left the shores of Great Britain. He was a Welshman by birth, but never got the encouragement his talent deserved. To show the opposition he met with in erecting that mill, I will give you an incident. There were two iron-masters from Lancaster county, by the name of Hughes and Royer, who went to Mr. Mason and said it was impossible to roll iron. As Mr. Lewis said he could do it, Mr. Mason told them to go to Mr. Lewis and talk to him about it. They did so, and told him what they had said to Mr. Mason. They thought it a shame for him to put Mr. Mason to so much expense, as it might ruin him. "Mr. Lewis," said Mr. Hughes, "you know you can eat." Yes, he knew that. "Well, how do you know it?" He could not tell exactly how, but he knew he could eat. "Well," said Mr. Lewis, "You have done it before, and that is why I know I can roll iron, I have done it before." "Very well," said Mr. Hughes, "go ahead, and when you are ready to start, let us know, and we will come on to see the failure." According to promise, they came and were perfectly satisfied of its practicability. The worst feature of the case was that, after the mill was finished, they discharged Mr. Lewis and never paid a cent for his labor.

The first rolling mill in the neighborhood of Pittsburgh for rolling bar iron was commenced in 1818 and started 1819. It was called the Union Rolling Mill. I was present when they commenced the work for the foundation. It was on the ground now occupied by part of the Pennsylvania forges. The second mill was built in what was then called Hogtown, on the top of Grant's Hill, where they hauled the water to supply it in carts from what was then called Hog's Pond, or from the river. The mill was owned by Hays & Adams.

About 1834 several mills were commenced in the neighborhood. Shoemaker's, Lloyd & Black's, Lawrence & Sterling's, Eligo, Bailey & Brown's, one in Allegheny, below the Suspension Bridge, and one on Pine Creek.

In 1817 Mr. Lewis told several gentlemen here, whose names could be mentioned, that Pittsburgh would be surrounded by rolling mills, that it would be entered by railroads from every point, and that cast steel would be made there for less than one-fourth of what it was then selling at. He told them also that there were three veins of coal beneath the bed of the Monongahela River. Three years after, in sinking a salt well at Saw Mill Run, they went through the three veins. They looked on him as an enthusiast, and laughed at him, but he lived to see the most of his predictions realized. Yours, respectfully,

SAM C. LEWIS,
Thirty-eighth street and Rowley avenue.

The Officers of Machinery Hall, Centennial Exhibition.—The following list will be found convenient for reference by exhibitors in Machinery Hall:

John S. Albert—Chief of Bureau of Machinery Hall.

Malum Stetson—Secretary.

J. G. Sanderson—Volunteer aid.

Friedrich Ungeuer—Volunteer aid.

Lewis W. Robinson—Superintendent in charge of office.

Henry Fourfax—Engineer.

Joseph Hirst—Superintendent in charge of Machinery Building.

G. H. Woods—Engineer in charge of south-east section of Machinery Building.

Wilson K. Purse—Engineer in charge of north-west section of Machinery Building.

George H. Hubbard—Engineer in charge of south-west section of Machinery Building.

Philip Voorhee—Engineer in charge of north-east section of Machinery Building.

John Cotter—Engineer in charge of hydraulic annex.

James L. Hodson—Engineer in charge of shafting.

John T. Hawkins—Superintendent in charge of all buildings south of but connected with Machinery Hall.

Philip Pistor—Engineer of the same.

William A. Drippe—Superintendent of all buildings west of but connected with Machinery Hall.

John D. Curtis—Engineer of the same.

L. D. Norton—Superintendent in charge of all boilers and steam pipes.

J. C. Kilgore—Engineer of the same.

W. E. Plummer—Superintendent of Shoe and Leather Building.

[Continued from page 1.]

considered and the mill planned to work steel should it be necessary. Ground was broken at Reading in the spring of 1867, and the first rail turned out in March, 1868.

It was the intention from the inception to make a rail of the very first quality, and, while it was not believed they could be made for any less cost than the market price of an ordinary rail, the profit or gain was in the enhanced endurance of the product. The result has fully justified the wisdom of the policy, and the expenditure for the plant has been more than returned to them directly by the dollars saved in being their own manufacturer instead of purchasing from outsiders, and indirectly, which is of paramount importance in the longevity of the rail, requiring less frequent renewals of the tracks, and of course, in the expenses for repairs. The nature of the trade being especially destructive to the permanent way.

The mill consists of 12 single puddling furnaces with a yearly capacity of 6500 tons puddled bars; 8 heating furnaces and 2 reheating furnaces capable of furnishing, in the manner hereinafter mentioned, 20,000 gross tons finished rails annually. It is more especially a re-rolling mill. The method adopted for making the rails was to work about two-thirds old rails with one-third new or puddled iron. Three pieces of old rails are piled on two layers of puddled iron, and heated and rolled into 3 inches and 4½ inches by 1 inch flats. These form the body of the pile, being piled so as to break joints. The head piece is rolled from a 9 inch square rule of these same flats, heated and rolled into a slab 9 inches wide by 2 inches thick, forming about 22 per cent. of the whole pile. The rail pile thus made up to a section 9 inches square is rolled in three-high 23 inch rolls, until reduced in six passes to a bloom 7 inches wide on the base, 5 inches high and 5 inches wide on the top. The bloom would somewhat naturally assume this shape in course of reduction, but it was more particularly given to distinguish the head part of the bloom from the flange. The bloom is then carried hot to a reheating furnace and wash heated, preparatory to the final rolling, to the finished rail, which is done on a two-high 23 inch train in six passes; a total of 12 passes from the 9 inches pile to the rail 4½ inches high. The use of the puddled iron with the old rails prevents the dryness inherent generally in re-worked iron, and insures, with the wash heating, better welds. The bloom is kept in the reheating furnace sufficient time, say 15 minutes, to bring it up to a good welding heat. The bloom going quite hot to the finishing rolls is very completely welded in the first three passes, and as the rolling is done in one direction only, the rolls being too high, it is believed the cinder is nearly all expelled instead of being retained to some extent, by being chased backward and forward, as would likely be done by rolling in both directions on three-high. After the bloom is thoroughly cemented, the cinder being no longer essential, it is well not to retain it in the rail. It is very evident in the rolling on the two-high train that the rail comes from the last or finishing pass colder than it would if rolled on the three-high rolls, from the fact of more time being required for the rolling, in carrying over the rolls instead of passing through a groove, and thus considerable heat is lost. The colder the rail is rolled in the last few passes the denser and harder will be the metal. In this way an extremely round rail is obtained, with a good welding surface.

All the rails are stamped with date of laying, and as the rails are not sold, but retained for re-rolling, it is easily ascertained what the life has been.

The reports of the president of the railroad, made from year to year, since 1868, shows the life of these rails. Out of 9000 tons of rails made and laid in 1868, the first year only 4500 tons, or 50 per cent., had been returned at the end of 1875. Of those made and laid in 1869, 17,000 tons, 4000 tons or 24 per cent. have been returned. In 1870, 17,500 tons were made, 3000 tons, or 17 per cent. were worn out, leaving 88 per cent. in use after six years, having carried some 50,000,000 gross tons, inclusive of weight of engines and cars. It should be stated that at the expiration of the year just named, the weight of the rail was increased from 64 to 68 lbs. per yard. The product of 1871 was 19,000 tons, 92 per cent. being still in a good condition, and of the product of 20,000 tons of 1872, only 6½ per cent. has been worn out under a tonnage of 35,000,000 tons. These tests would seem to show the uniform excellence and durability of the rails turned out by the process described.

Late in 1899 it was decided to make some particular tests of rails manufactured in the usual way, with the exception of leaving the old rails out of the head pieces, and in substituting some special brands of pig iron, worked alone for this purpose. In January, 1870, these were placed where they would be required to carry most of the immense tonnage from the coal regions, and the wear could be carefully noted.

In making these rails a pile was made from muck bar, puddled against soapstone, compressed in the rotary squeezer, and rolled into flats 4½ and 3½ by ¾ inches and piled, breaking joints, 8 inches wide by 6 inches high. This is rolled into flats, 4½ and 3½ inches, and formed into a pile of a section 9 inches square. Some of these piles were rolled flat or horizontally, and others on edge or vertically, into head pieces or tops, 9 inches wide by 2 inches thick. The body of the rail piece is made up of 4½ and 3½ inch flats, rolled from a pile of three pieces of old rails, and four pieces puddle iron. The rail pile, thus made up of a section 9 inches square, is rolled into a bloom 7 inches square at base, 4 inches on top, and 6 inches high, with the head at the top, and charged into a reheating furnace, and was heated before final rolling in the two high rolls to the rail section. The rolling of some of the piles for the heads, on edge, so as to bring the

welds vertical instead of horizontal in the finished rail, was for the purpose of comparing the two methods. In the horizontal piling most of the failures arise from lamination. The best results followed from the edge rolling. The welds, although vertical in the heads of the finished rails, are in practice rolled horizontal, from the manner of the rail going through the last three passes on its side, the vertical pressure more thoroughly welding the head. Twelve varieties of pig were selected for trial, 9 from the Schuylkill Valley, 2 from the Lehigh and 1 from the Susquehanna.

Pieces were taken from the different kinds after being puddled, and once reworked and tested for tensile strength, the maximum being 66,000 lbs. and the minimum 45,000 lbs. to the square inch. They were divided into three classes, the neutral irons, with a tendency to cold-shortness, gave an average of 63,200 lbs., the red-short 60,700, and the cold short 52,500 lbs. These were again arranged in two lots, those with heads rolled flat and those with heads rolled vertical, and the tonnage, including weights of engines and cars actually carried by each kind before it was worn out, was as follows:

	Rails with heads rolled flat.	Rails with heads rolled vertical.
Total average.....	25,324,348	20,044,670
Red-short average.....	26,551,808	22,819,300
Neutral average.....	25,112,593	24,789,351
Cold-short average.....	26,645,538	33,472,600

From this we gather that the cold-short irons rolled on edge show on an average the most endurance. The parcel of rails doing the best was removed after six years of service, during which time 55,000,000 tons passed over them.

The hard, fine grained, cold-short irons are more durable than the softer and stronger fibrous irons of a red-short nature. The cold short irons appear to give the best welds, and the stronger they are the better. The iron in the heads of the rails bearing the maximum tonnage was from a blast furnace in the vicinity of Reading, and was smelted from a mixture of 60 per cent. East Pennsylvania hematites, 25 per cent. Tilly Foster, and 15 per cent. East Run magnetic ores.

The analysis of this head iron gave:

Phosphorus.....	.422
Silica.....	.392
Sulphur.....	.032
Manganese.....	.164
Carbon.....	.947
Iron.....	98.963
	100.000

In the same track with these experimental rails were laid some rails with the heads formed of a solid hammered bloom. These gave a tonnage of 28,000,000 tons; as the iron was too soft from the lack of sufficient rolling they mashed out in spots under the heavy traffic. Puddled steel headed rails have done much better.

While admitting the vast superiority of steel for rails required to stand a very heavy traffic, iron, if carefully selected and properly manufactured, has capacity for which it seldom gets credit.

THE SOUTHEAST MISSOURI LEAD DISTRICT.

By Professor G. C. Broadhead, of Pleasant Hill, Mo. The lead district of Southeast Missouri covers an area of over 3000 square miles. A general section of the rocks of the southeast part of this region would be about as follows, numbering from the lot:

	Feet.
1. Sandstone (the 2d of Mo. Geol.).....	20
2. Chert beds (beds of passage below).....	125
3. Magnesian limestone, chert and quartzite.....	100 to 300
4. Lower magnesian limestone.....	100 " 150
5. Griststone and lignula beds.....	50
6. Ozark marble beds.....	5 " 20
7. Sandstone and conglomerate.....	5 " 90
8. Porphyry { Archean.....	
9. Granite.....	

The thickness is approximate.

The oldest rocks in Southeast Missouri are the porphyries and granites. We know that the former are older than the above named rocks, because we have found the lowest sandstone resting unaltered on them and also upon the granite. We also have found the lowest magnesian limestone resting on this sandstone, and also unaltered upon the porphyry. We therefore have a correct succession of rocks. Our data thus far is not sufficient to establish the age of the granites, or whether they are older than the porphyries, but we incline to the belief that they are. Our porphyries, though, are exactly similar to those of Massachusetts and New Brunswick, which are considered Huronian. We therefore feel correct in calling ours Huronian. Our granites may be Laurentian.

The ores of Nos. 4 and 5 include those of lead, copper, nickel and cobalt. The oldest worked mines are those of Mine La Motte, where lead was mined soon after 1730.

At intervals these mines have been much worked during the present century. The ore occurs disseminated in horizontal limestone beds throughout an average vertical thickness of 7½ feet. The cap rocks and bed rock are of like composition, but contain very little ore. In one portion of the mines copper ore (chalcopryite) is quite abundant, and is intimately associated with the galena. At another place we find nickel and cobalt quite abundant. At the Avon and Fox mines the ore occurs very similarly, and the formation is of the same geological age. At the Fox mines much of the galena is found in drusy cavities, associated with pyrites, calcite and dolomite.

At the St. Joe Mines the rocks are similar to those of Mine La Motte, but the ores are only lead and copper. The St. Joe Company at present have two working shafts of 80 and 100 feet depth, the ore bearing rocks being the lower 25 feet, arranged in tolerably uniform layers of 2 to 4 feet thickness. No vertical veins were observed, but the mineral will sometimes follow vertical cracks. At one place solid layers of galena of about 3 inches thickness are intercalated with the limestone beds every few feet, but the ore is generally disseminated in

the limestone. In the upper beds bands of chalcopryite are of frequent occurrence.

Just adjoining the St. Joe land, and only a few hundred feet northeast, the Missouri Lead Mining and Smelting Company have sunk a shaft 130 feet, and bored 84 feet further, passing through rich galeniferous limestone, a section recorded by the company reports passing through limestone with disseminated galena as follows:

	Feet from Surface.
Galena at.....	31½
" at.....	46
" at.....	75
" very rich.....	78 to 80
" at.....	81
" a little from.....	83 to 97
" richly disseminated.....	103 to 114
" sparsely.....	104 to 114
" a good per cent.....	114 to 115
" a very little to.....	117
" a good per cent. from.....	117 to 127
" disseminated.....	129 to 138
" very rich.....	138 to 140
" disseminated.....	140 to 140.9
" fair.....	140.9 to 141.8
" very rich per cent.....	141.8 to 142
" disseminated.....	142 to 151.6
" very rich.....	151.6 to 152.3
" good disseminated.....	152.3 to 154
" lean.....	154 to 155.6
" rich disseminated.....	155.6 to 156.6
" lean.....	156.6 to 157
" very rich.....	157 to 158
" good.....	158 to 159
" lean.....	159 to 161.3
" rich.....	161.3 to 164
" a little ore.....	164.3 to 165
" very rich.....	165 to 167
" mineral.....	167 to 175
" lean.....	175 to 182
" disseminated.....	182 to 194
" very rich.....	194 to 197
" some mineral.....	197 to 204

Boring stopped.

The limestone here lies about horizontal, and it is impossible at present to estimate the probable extent of the galena, but it is undoubtedly very great.

The galena at St. Joe, as at other mines, in the lower limestone, is coarsely granular, and cubes are of rare occurrence, but in small drusy cavities very rich crystals of a secondary form are often found. Iron pyrites, dolomite and calcite abound at the Fox mines. Calcite and dolomite are of general occurrence. Barytes, if at all seen, is very rare.

With regard to the origin of the galena in these mines, we would give as our theory that the limestones were first formed in deep seas. That after and during a long period of subsequent time, the galena, in a state of solution, replaced a portion of the limestone beds which had previously been softened by acids. We would not hazard the opinion that the process of replacement was recent, but rather believe it to have taken place in some remote period of time, and probably before the deposition of the galena among the more recent formations of Southeast Missouri; also, that its formation must have continued through a long period of time, for the galena did not replace the limestone in the different beds at the same time, nor is it certain that the process was in progress in different beds at the same time.

Some of the mines of St. Francois county, for instance the Valle mines and all of those of Washington and Crawford, occur in the third magnesian limestone. The ore occurs either: First, in caves or openings; second, in leads or lodes.

Although there may be a slight difference in the form or shape of the deposit, still I believe that all the galena ores of this formation, excepting the leads, may come under this head, nor am I certain that the vertical leads should be separated. The limestones are often bisected by vertical cracks or fissures crossed by others. These are sometimes narrow, but are often widened out, probably caused by breaking off, and disintegration of masses of limestones. The ore and its associated minerals is limited by "runs" and "openings." The run is a widening of the opening, and must not be confused with the runs of Southwest Missouri.

At Prairie diggings, on "Old Mines" tract, we entered a run 7 feet wide at 55 feet depth, extending in a nearly northern direction, as far as explored, for several hundred feet. Other short runs or cave openings meet the main run, but generally terminating within a few feet. Others extending further developed into similar openings to the "main run." These "runs" or "openings" are filled with masses of decomposed magnesian limestone, barytes, iron pyrites, galena and calcite sometimes, confusedly arranged, but often in regular broken horizontal layers, the galena generally preserving a nearly horizontal position in its arrangement, and when disseminated it is found occupying very nearly the same horizontal line. The galena is sometimes inclosed by bands of pyrites, and at other times associated with a gangue of barytes, the latter apparently of more recent age.

The ore at Mineral Point occurs very similar and in irregular shaped openings. The mode of occurrence of ores at New Ishmael, or Palmer tract, is very similar to the last, and to the other just above named. At Mammoth mines, in Jefferson county, beautiful specimens can be obtained crystallized.

The Sandy mines occur in what is known as the second magnesian limestone. At these mines is found a nearly vertical fissure, varying from a knife-edge to 15 inches wide. The wall rock is magnesian limestone. The fissure is filled with a gangue of barytes with galena, and has been worked with variable success for many years. The course of the main fissure varies but little from a north and south line, and has been traced for several miles.

Of a similar character is the Jones' mine, 15 miles southeast of Versailles. The vein varies in width from 4 to 18, and includes a gangue of barytes, in vertical sheets, crystallized at their junction, and being galena near its southern exposed portion. It can be traced for three-quarters of a mile north and south. The vein can be easily traced out, but only near its southern exposure is galena found.

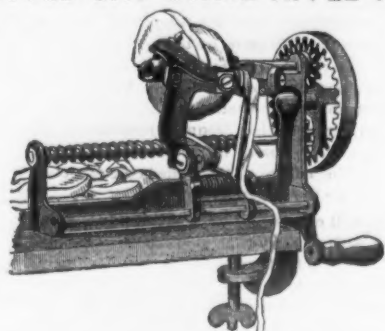
In Benton county we find a similar fissure vein, and being nearly the same magnetic course which has also been traced for three-quarters of a mile. Its minerals are iron pyrites, galena and blende.



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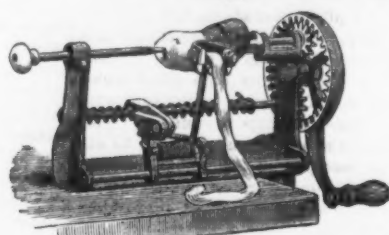


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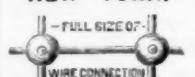
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THE HART, BLIVEN & MEAD MANUFACTURING COMPANY,

of Kensington, Conn., and 18 and 20 Cliff street, New York city, have placed in the Centennial Exhibition, at Philadelphia, an extensive line of samples of their productions. They are located at P. 69 and 70, in the southeast end of the Main Building, near the south avenue, and cover a space (a portion of it occupied by the Bradford Lock Works), 56 feet long and 7 feet wide, with avenues extending around all sides, and passages leading from the South avenue directly to the exhibit. The walnut cases in which the larger portion of the samples are shown contain 36 sample boards—18 in the upper and 18 in the lower section, tastefully arranged. The lower or table portion of the cases are slanting in form, and rest upon fluted piano legs, standing on a handsomely carpeted floor. The upper cases, which are perpendicular, are separated from the lower ones by a neat black walnut cornice. The whole is adorned by an elaborately carved and gilded sign extending the entire length, and lettered on both sides. At one end are pyramid shaped sample boards of Connell's celebrated gong bells. These are placed upon three wings, set on a turn-table, which revolves by means of a clock-work, and attracts general attention. At the other end of the long line of sample cases is their office, neatly furnished with writing desks, chairs and copies of the Hart Bliven & Mead Manufacturing Co's and Bradford Lock Work's catalogues. For the convenience of their customers who visit the Exhibition, they have placed a post office box in the office, to which there are eight daily deliveries. Around the whole structure is a handsome double bar nickel plated railing, between which and the sides the sample cases are placed samples of heavy goods, such as shovel and tongs stands, andirons, barn door trimmings, &c. The samples inside and outside the cases are divided into different classes as follows:

Carpenters' Hand Tools, viz.: Socket, firmer and framing chisels, corner chisels, carpenters' slicks, carpenters', coach makers', wagon makers' and farmers' drawing knives, screw drivers and scratch awls. Steel, iron and nickel plated carpenters' squares, &c.

Hardware used in Construction, Commonly Called "Builders' Hardware," viz.: Cast bolts, hinges, pulleys, sash and door fasteners, cupboard turns and catches, bat, coat, wardrobe and bird cage hooks, store door, trunk and chest handles, gate and thumb latches, drawer pulls, shelf and flower pot brackets, furniture casters, barn door trimmings, &c. These goods are finished in japanned, coppered and enameled iron, brass, silver and nickel plated and bronze metal.

Carriage Hardware, viz.: Iron, brass, oroid silver, nickel and gold plated carriage bands, shaft, neck yoke, whiffletree and pole sockets, coach handles, dash rods and collars, spring bar bolts, japanned and silver carriage knobs.

Stationers' Hardware, viz.: Japanned, figured enameled, bronze metal, nickel plated and verd-antique paper clips, paper files, check cancelers, paper weights, inkstands, pen racks, match safes, twine boxes and book racks.

House Furnishing Hardware, viz.: Brass and nickel plated andirons, japanned and enameled fire dogs, blower stands, shovel and tongs stands, kitchen sets, japanned, polished, brass and nickel plated shovels, tongs and pokers, spiral spring coal tongs, cleavers, steelyards, coffee pots and sad iron stands, toilet racks, boot jacks, &c.

Gong Bells, viz.: Bronzed and enameled, steel, polished brass, nickel and silver-plated, and bronze bell metal door and trip house bells, with crank, pull and thumb latch handles.

The foundation of the Hart, Bliven & Mead Manufacturing Company dates back just thirty-eight years ago. Mr. J. T. Hart, the vice president, commenced to manufacture a few articles in Connecticut in 1838, and the same year Mr. Charles Bliven commenced the sale of American hardware in a limited way in the city of New York. Mr. Edward B. Mead, the treasurer, joining him a few years later. In 1854 the present corporation was formed; the parties above named being then as now, the principal owners of the company, and are to be found every day active in the business. The managers of the company claim that none of the 1000 samples of different articles shown in the space allotted to them were made for the purpose of the Exhibition, but are strictly business samples, each one having its proper number and list price attached, and that the whole aim and object of their exhibit means business. The exhibit is in charge of Mr. Charles J. Bliven, the general manager of the company, who is in daily attendance at their Centennial office.

THE BRANFORD LOCK WORKS, Branford, Conn., have their sample cases arranged in similar style to those of their agents, the Hart, Bliven & Mead Manufacturing Co. They contain 16 sample boards, on which are arranged 500 samples of mortise and rim locks, latches, knobs, &c. Among articles to which they call particular attention is their patent undercut mineral and porcelain door knobs, whereby they claim that the fastening of the top to the neck of the knob, makes them the most durable and best secured knobs in the market. Their rim and mortise locks are all made with a lever and straight spring operating the latch bolts, which they state are less liable to break and get out of order than the bowed springs used by other makers. Patent telescope rim night latches, and locks with flat steel keys, and self adjusting cylinders extending for doors varying from 1 1/2 to 3 1/2 inches thick. Also the Gilbert patent lock, the neck of the knob and the escutcheon being cast in one solid piece of metal, and the

lock operated without turning the knob. The above two exhibits occupy the largest space, and contain the most complete line of legitimate samples that we have seen in the Hardware Department of the Exhibition. They are noticeable, not only for the good taste shown in their arrangement and classification, but as an exhibition of articles of prime necessity in the trade they represent. The exhibit is conspicuous for its great variety and the common sense finish of everything presented. Mr. Chas. J. Bliven is also in charge of the goods of the the Branford Lock Works.

MALLORY, WHEELER & CO.,

New Haven, Conn. This firm have a display of locks, which in extent, variety, neatness and general excellence, fully maintain the reputation of this well known firm. The case in which the exhibit is made is of black walnut, with plate glass front, and silver-gray maple back, upon which the goods are arranged. The effect is very pleasing, and while there is no attempt at ornamentation, the exhibit is at once attractive and interesting. The display includes every description of door and pad locks in great variety of styles; ornamental bronze fronts, mortise locks, with knobs to match; ornamental English bronze locks, both rim and mortise, with knobs to correspond; brass and iron front mortise rim locks, &c., &c. A leading feature of the exhibit is in hotel locks, this firm having a large line, including rim and mortise locks with four tumblers, which are in sets of 140 or less, all different, with master key to pass the whole, and master key to differ in each set. The makers claim that these are the only locks made with a plurality of tumblers, and so many changes, with safe master key to pass the whole set, and key operating in same key-hole both sides of the door. They also exhibit a cheaper line of master keyed locks with less tumblers and changes, which makes their line of this class of goods very complete. We are informed that these locks are very popular, and are used in many of the new hotels in Philadelphia, as well as in leading hotels in other parts of the country. Another very prominent feature is their display of padlocks, the line being large, including every variety of style and finish, and in keeping with other portions of the exhibit, which is large, interesting and attractive.

THE DOUGLASS AXE MANUFACTURING COMPANY, Boston, Mass. This firm make an exhibit which attracts the attention of every visitor to that section of the building in which they make their display. The exhibits are attractive in themselves, but the setting and general arrangement is so effective that the attention of the most casual observer is at once arrested. The case is of black walnut, carved and ornamented in the most artistic style, and is probably one of the finest in the building. On one side there is a superb representation of an Indian with his tomahawk, and on the other side a backwoodsman with his axe, both very appropriate in connection with a display of this kind, while the carving is in the highest style of art. The display is arranged with great taste—quite in keeping with its surroundings. Every description of edge tools manufactured by this firm is exhibited, axes, adzes, hatchets, mattocks, picks, &c., and, by way of contrast, an axe of 1836 (never used), is placed with them. In the upper portion of the case an elegant little casket is to be seen, which contains five medals, trophies of successful competition, in previous home and foreign exhibitions.

THE GAYLORD MANUFACTURING COMPANY, Chicopee, Mass., make an exhibit which, though small, is one of great elegance and special merit. The leading feature is in swords, buckles, &c., which are of great beauty, and very attractive. They also display a full line of cabinet locks, which will fully sustain the reputation of the firm for this class of goods.

THE UNION MANUFACTURING CO.,

New Britain, Conn., and No. 98 Chambers street, New York, show a handsome case of ornamental and plain butt hinges in great variety. This company claim to be the pioneers of the drilled, milled and wire-jointed system which has revolutionized the manufacture of these goods, placing on the market the elegantly finished butt hinges of to-day at nearly as low a figure as the old common cast test butts. Aside from the greatly improved finish which the present system of butt hinge manufacture affords over the almost obsolete method, referred to above, the drilled and wire-jointed goods possess the great advantage of not allowing the door to sag. Among the butts manufactured by this company we notice cast drilled, fast and loose joints, japanned of all kinds, silver tipped, with and without acorns, solid bronze with and without caps in fast, loose, or loose pin; japanned and silver tipped parliament butts for inside blinds, &c.; enameled and nickel plated for same purpose. They also show a new style of figured japanned butts, which is of very handsome design. This house has recently added to their specialties a newly invented spring hinge, both single and double acting, which is very efficient for its purpose. It has two coiled springs, a solid pin and solid milled bearings, and can be used for either right or left hand doors. They are made japanned, nickel plated, and in solid bronze. The display of butt hinges by this company is very fine, and would surprise the uninitiated in the mysteries of the hardware trade with the wonderful detail and almost infinite variety in this branch of the business.

In the pump department of Machinery Hall the Union Manufacturing Company make another very creditable display of goods, showing a large line and great variety of pumps, suited to almost every conceivable purpose. Among the pumps shown by them are iron, brass, brass cylinder, galvanized and nickel plated goods. They manufacture about 600 different styles of pumps, including 50 styles of yard pumps, single and double-acting house pumps, and 7

sizes of hydraulic rams. They also show power force pumps for factories, mines, &c.; garden and fire engines, boiler feed pumps, and brass and iron ship pumps of the latest and most approved designs. This house manufactures 12 sizes of brass and iron hand and rotary pumps, and a large variety of wind-mill pumps. In the arrangement of the latter they have made such improvement as enables them to fit up any standard with wind-mill tops or attachments. They also have on exhibition drive well points, lower working cylinders with bolt and screw attachments, single and double-acting. Of their new "Centennial" pumps ten styles are made, adapted for house or outdoor use. Among their other specialties not mentioned above, are aquarius ale and beer pumps, plumbers' force pumps, water charges and sand holders, check valves, air barrels, strainers and rests, &c. This company claim that their method of attaching barrel to base in their pumps by means of a brass nut, is an invaluable improvement over the iron nuts in common use. The pumps on exhibition are taken from their regular stock, and although the assortment shown is not as large as some others, enough are displayed to give a fair representation of the style and finish of their leading specialties in these goods.

SPILLER BROS.,

St. Johns, N. B., exhibit socket and tanged firmer chisels, framing chisels, slicks, broad axes, hatchets, mattocks, machinists' hammers, drawing knives, cooper's tools and carpenters' hammers, &c.

BOIVIN & COMPANY,

Quebec, exhibit axes and edge tools, with both handles and blades painted and lacquered more gaudily than is the custom with American makers.

DATES PATENT STEEL COMPANY,

Niagara, Ontario, show some excellent patterns of the following tools, in good commercial finish: Axes and mattocks, broad hatchets and axes, carpenters' lath and shingling hatchets, slicks, cooper's adzes, butchers' cleavers, carpenters' hammers, &c.

COWAN & BRITTON,

Canoque, Ont., exhibit strap and T hinges, gate hinges, &c.

CARVEN GILMORE,

Montreal, exhibits a case of augers and auger bits. These goods are shown in several patterns. This case also contains specimens of pump boring augers. All the goods are well finished, and will compare favorably with any similar hardware on exhibition.

JAS. WARNOCK & COMPANY,

Galt, Ont., show samples of springs and edge tools; also sets of tanged and socket firmer chisels, long thin firmers, framing and corner chisels, drawing knives, in various styles; axes and hatchets, broad axes, picks, mattocks, carpenters' slicks, &c. These goods are well and sensibly finished, and the styles correspond with those of American makers.

R. E. SMITH & CO.,

St. Catharines, Ont., make a very handsome exhibit of saws, and state that their goods are made of Wm. Jessop & Sons' Sheffield steel. The following varieties of saws are shown, and are well and carefully finished: hand, panel, rip, back, compass, pruning and keyhole saws, butchers' bow saws, circular saws in great variety, from 1 1/2 to 72 inches in diameter; concave saws, veneer segments, mill, maul and gang saws, cross-cut saws with fast cutting teeth; one man cross-cuts, and billet, turning and felloe webs in great variety; plastering trowels and patent cross cut saw handles.

J. M. WILLIAMS & CO.,

Hamilton, Ont., exhibit plain stamped and japanned tinware, water coolers, lanterns, toilet sets, grocers' caulkers, cake boxes, and specimens of deep stamped and retinned goods.

D. F. JONES & CO.,

Gananoque, Ont., show a large assortment of shovels, spades and scoops and hay and manure forks.

A. S. WHITING MANUFACTURING CO.,

Oshawa, Ont., make a beautiful exhibit of hay, manure, spading and other forks, hoes, rakes, &c. Some of these goods are shown in good commercial finish, and others are extra finished. The assortment, which is large, will compare favorably with any similar goods in the Exhibition. They also exhibit a large assortment of scythes, grass hooks, corn and hay knives, and four prong wood barley forks.

H. R. IVES & CO.,

Montreal, exhibit handsome specimens of cast iron roof cresting, cast iron finials, composite iron railing, ornamental iron posts and railing, and ornamental wrought iron gates in handsome and original designs. They also show a case of silver-plated coffin trimmings, and a good line of cast iron hardware, including brackets, drawer pulls, cupboard turns, barrel bolts, door latches, square bolts, barn door hangers and rollers, bench screws, hat and coat hooks, axle or frame pulleys, clamps, inside and outside blind hinges, chain bolts, screw pulleys, sash fasteners in Berlin or ornamental bronze; furniture casters, twine boxes, and irons, cork squeezers, boot jacks, &c. All these goods are finished in the ordinary manner of the trade, and look like fair samples from stock.

STARR MANUFACTURING CO.,

Halifax, N. S., show a handsome case of Forbes' Patent Acme skates. The variety of sizes and styles of finish is large, and the goods are beautifully finished and tastefully displayed. The lowest grade of goods on exhibition is their No. 5, which has malleable iron upper and plainly finished steel runner, without lacquer or any attempt at ornamentation, and with an elegant common sense skate. The next grade is styled No. 7, the upper of which is the same as No. 5, with the exception that all

the edges are polished. Their No. 10 is a handsome silver-plated skate, and is the same as No. 7, with the difference of the plating. They also exhibit a silver-plated skate, No. 12, but the difference between it and the No. 10 is not apparent. No. 14 has the same silver-plated runners as Nos. 10 and 12, with the upper portions gold-plated, and is a very elegant article. They show some of these fine skates with ornamental heads, such as birds, horses and dogs. They say of this skate that it is "the only reliable and really self-fastening skate ever invented—can be instantly and firmly attached to any boot—no straps to lame the foot—no heel plates to clog up."

THE STANLEY RULE AND LEVEL COMPANY,

New Britain, Conn. This firm make a display of their manufactures in the Main Building, which is justly admired, and is the subject of favorable comment by all who give the exhibit a critical examination. The display is arranged with much taste, and is among the finest of its class. The exhibit includes boxwood and ivory rules, plumbs, levels, try squares, bevels, gauges, spokeshaves, Bailey's patent iron and wood planes in great variety, plane irons, &c., all of which combine beauty of style and high finish. Among the various tools we notice Miller's patent combined plow, filletster and matching plane, which is a most ingenious and successful combination of the common carpenter's plow and adjustable filletster, and a perfect matching plane. The patent tonguing and grooving plane is another useful article, consisting of two separate tools, which are always used in connection with each other, and are here combined in one, thus affording two superior tools in a cheap form, and occupying no more room than one ordinary tonguing or grooving tool. The stock of this tool is made of metal, and it has two cutters fastened into the stock by thumb-screws. The guide or fence, when set, allows both of the cutters to act, and the cutters being placed at a suitable distance apart, a perfect tonguing plane is made. The guide or fence, which is hung on a pivot at its center, may be easily swung around, and for end. Thus, one of the cutters will be covered and the guide held in a new position, thereby converting the tool into a grooving plane. A groove will be cut to exactly match the tongue, which is made by the other adjustment of the tool. The guide or fence is hung for grooving boards planed from 1 inch stuff, and on these the tongue and groove will both come in the center of the board. Boards varying from 3/4 to 1 1/2 inch in thickness can be matched equally well, by working the planes so that the tongue and groove shall both come at their regular distance from one end of the boards to be matched, leaving the distance to the other edge to vary as it may. One extra width cutter accompanies the tool, to be used on the outer side of the tongue, in tonguing boards thicker than those planed from 1 inch stuff. The last article we shall notice is the patent improved miter box, the peculiar features of which are as follows: The frame is made of a single casting, and is subject to no change of position, being finished accurately at first, it must always remain true. The slot in the back of the frame, through which the saw passes, is only 3/8 of an inch wide, thereby obviating any liability to push short pieces of work through the slot when the saw is in motion. This miter box can be used with a back saw or a panel saw equally well. If a back saw is used, both links which connect the rollers or guides are left in the upper grooves, and the back of the saw is passed through under the links. If a panel saw is used, the link which connects the rollers on the back spindle is changed to the lower groove, and then the blade of the saw will be stiffly supported by both sets of rollers, and be made to serve as well as a back saw. By slightly raising or lowering the spindles, when necessary, the leaden rolls at the bottom may be adjusted to stop the saw at the proper depth, and by the use of a set screw the spindles on which the guides revolve may be turned sufficiently to make the rollers bear firmly on the sides of a saw blade of any thickness. If a narrow saw blade is used, or if the saw blade becomes narrower from use, the rollers may be lowered on the spindles by removing some of the brass rings from under them.

BUCK BROTHERS,

Millbury, Mass., make a handsome display of edge tools, which are entered for competition. Their goods are shown in a handsome silver-plated case, 9 1/2 by 2 1/2 feet, in which are tastefully arranged samples of the following goods: Sets of cast steel firmer chisels and gouges, paring chisels and gouges in sets, one set of cast steel turning chisels, one set of cast steel turning gouges, &c. Their exhibit of socket chisels is very handsome, and comprises socket firmer chisels, gouges and framing chisels in sets, samples of millwrights' socket firmer chisels and gouges, corner chisels, carpenters' slicks and flat and middle sweep gouges. They also present specimens of their London pattern screw drivers, screw driver bits, reamers, and countersinks; best quality nail sets, punches and cold chisels, carving chisels and gouges, straight, curved and short bend; a fine assortment of plane irons, &c. These goods, which are all well finished, are, we are informed, fair samples of their regular stock. They are placed in a position that affords opportunity for a critical examination, and we think they will stand the test and compare favorably in style, finish and variety with any similar display on exhibition.

THE LAMSON & GOODNOW MANUFACTURING CO., 88 Chambers street, N. Y., make a very handsome exhibit of table cutlery, showing the largest assortment of fine quality carving knives and forks that we have seen. Of finely finished table and dessert knives, in cases, they make a beautiful exhibit, showing these goods with silver-plated, ivory and pearl

handles. In their medium and cheap grades of table cutlery nothing is shown.

L. HERDER & SON,

Philadelphia, show a handsome case of tailors' shears and scissors, bent shank and blade shears, trimmers, &c. All of these goods are well finished.

THE WATERBURY BRASS CO.,

Waterbury, Conn. No. 52 Beekman street, New York, make a very showy exhibit. Among their goods we notice copper rivets and burrs in all sizes, brass rivets, percussion caps, gun wads, eyelids, game bags, shot pouches, leather case measuring tapes, pocket measuring tapes in German silver and composition casing; a fine assortment of powder flasks in copper, German silver and metal, covered with hog skin; pistol flasks, shot flasks, whistles, powder and shot flask furniture, brass kettles, &c. Beside the above mentioned goods they show a full assortment of sizes of brass and copper wire, sheet brass and brass and copper rods.

LEONARD BAILEY & CO.,

Hartford, Conn., show a handsome line of their "Victor" iron planes. They also exhibit "Langdon" miter boxes, boxwood and ivory rules, made by Stephens & Co., of Riverton, Conn., and spirit levels in great variety.

Mining and Metallurgy at the International Exhibition.

NO. II.

NORWAY

embraces iron, nickel, cobalt and silver in its metallurgical contribution. The impressive feature is a trophy erected by the Cathrineholm Iron Works, representing an ancient ship or "viking," the prow and deck being of plate iron, and the mast and the spar are formed of hammered bars of various sizes. On either side of the mast are ladders made in imitation of rope of knotted and twisted bar iron, bent cold to show its elasticity and strength, and they are really remarkable. On the deck of the "viking" a mailed officer stands with a club in hand made of knotted and twisted iron; behind him is a cabin composed of a pile of various sized hammered bars, and in front of him are heavy anchor chains. The get-up of the affair is worthy of notice, and is a novel way of illustrating the product of the works. Around the hull there is quite a collection of projectiles, while to the sides of the vessel are hung round shields, ornamented with nails, spikes, punching, &c. Behind the vessel is a case of various sized nails and spikes.

Raw and calcined nickel ores and the products of them are displayed by the Bamble Nickel Works and the nickel works of Ringenget, and the Kongsberg Silver Works exhibit a large collection of argentiferous rocks, native silver, models of nuggets and ingots, which are quite interesting. There are several fine geological maps and sections, and a number of specimens of the different rocks are exhibited in connection with the maps.

BELGIUM

contributes some interesting features of mining and metallurgy, but the display is not as comprehensive as might be expected from a country producing more than one-fifth as much iron and one-third as much coal as the United States. The most prominent feature of the mining display is in Machinery Hall, and consists of the apparatus employed by Mons. T. Chandron in sinking coal shafts. This is simply an artesian well boring apparatus on an immense scale, and is composed of the following parts. A trepan weighing 15 tons, made of forged iron and fitted with cutters secured by taper keys, so as to make a cut 6 feet long. This trepan is raised about 3 feet by steam-power and then dropped; at each lift the rod being turned so that the tool cuts out a circle 6 feet in diameter. This sized tool has penetrated in the softer sandstones one meter per day. A massive iron bracket, or saw pump, fits into the cut thus made, and is used, when the tool is withdrawn, to remove the debris. After the first tool has penetrated about 30 feet, the second trepan is substituted. This is a tool constructed similarly to the first, but is much heavier, and is 16 feet long, with a central guide working in the opening made by the first trepan. This tool has followed up the first tool at the rate of a foot per day. The presence of water does not interfere, but rather is an advantage in boring the hole; and for the purpose of recovering the tools, or cutters, if broken, there are three tools on exhibition, viz.: A grapple for broken rods, a sweep to catch the sections of lifting bars, and a grapple to remove broken cutters or troublesome stones. This latter is remarkably ingenious, and consists of a pair of double lazy tongs, so arranged that when lowered the arms stretch to the sides of the hole, and when raised they scour the bottom, and pick up the troublesome cutter or stone. To prevent breakage, the trepans have a sliding motion on the suspending bar, thus permitting the shock of striking to be expended without injury. When the cutting is ready for lining, circular plates are let into the opening, the bottom plate or cylinder sliding inside of the second ring, and being surrounded with a moss gasket, which is compressed between the flanges, forming a means of keeping water out at the bottom. The second ring is provided with a convex bottom, and it therefore floats on the water. As ring after ring is added, the water is allowed to escape, so as to permit the rings to sink gradually. Suitable guides keep the casing from tilting until it is finally secured upon the hard, impervious strata, when the shaft is pumped out and is ready for use.

Adjoining the Chandron apparatus is an interesting exhibit of the rock drilling car of Mons. Dubois et Freres, which was used largely in the St. Gotthard Tunnel, and also employed in the great bore at Mt. Cenlis. It is

a compact arrangement of four independent drills, operated by compressed air, placed on a carriage and provided with proper facilities for vertical and lateral motion, and also for rotating the drills. A model of a safety cage for mining shafts, and some iron sills for mine railways, also form a part of the Belgian mining exhibit. These sills are flat iron bars, bent so as to form chairs for the rails at the proper gauge; the rail being secured by simply driving a wooden wedge between it and the bent portion forming the chair.

In the Main Exhibition Building there are some fine specimens of argilliferous lead ore yielding over 80 per cent. of lead. The rest of the metallurgical display consists of sections of beam, channel and angle irons, wrought iron riveted girders, axles, rails, nails, spikes, tacks and wire. The usual exhibition of toughness by twists and bends is not overlooked by the Belgian contributors; and one display of beams, etc., has on top of the case in large letters, "delivered free on board in New York for \$40 per ton." Some of the plate iron on exhibition displays remarkable qualities, and a rack of sheet iron is, to all appearances, equal to the Russia sheet.

Some American Irons.

To the Editor of *The Iron Age*: Notwithstanding the reported national pride and boastfulness, our people seem very slow to realize the fact that we can, and do, make just as good, if not better, iron and steel, as is made elsewhere. This is not a mere idle assertion, but is supported by a great quantity of carefully made tests.

I had occasion about three years ago, as assistant inspector of the St. Louis bridge, to make a considerable number of critical tests of iron and steel, as well as to become acquainted with the results of those made by other engineers for that and other structures.

In connection with the article on "American and Foreign Irons" in your issue of June 15th, the following extracts from my records may prove interesting:

Tests of United States iron manufactured by Wayne Iron and Steel Works— $\frac{3}{4}$ in. boiler plate.

Tested by C. A. Uber, U. S. N., Inspector Louisiana bridge, on one of Richle Bros.' machines (beam):

No. 1 broke at 68,000 lbs. per sq. in.

No. 2 " " " " " "

No. 3 " " " " " "

No. 4 " " " " " "

No. 5 " " " " " "

No. 6 " " " " " "

No. 7 " " " " " "

No. 8 " " " " " "

At another time No. 1 broke at 83,000 lbs. per sq. in.; No. 2 broke at 75,500 lbs. per sq. in. Another single specimen at 76,000 also.

"19" with upset heads, tested by C. A. Uber, Louisiana bridge, and C. S. Dutton, St. Louis bridge, on St. Louis hydraulic machine:

No. 1, sect. area, "7843 in., broke at 71,421 per sq. in.; ruptured area, "5153 in.

No. 2, sect. area, "7885 in., broke at 69,783 per sq. in.; ruptured area, "4901 in.

All of these specimens could be bent or twisted cold in any shape, and showed when broken, a very finely fibrous fracture. As some have insisted that this brand of metal was properly a steel, and as there is a considerable difference of opinion as to what distinguishes

the effect of the shape of incisions upon the ultimate strength of iron.

We had three bars from the Union Iron Mills, prepared as plain cylinders inside the heads, with the exception of three grooves accurately cut to a uniform depth in a lathe. These grooves were rectangular, curved and V-shaped.

The annexed figure shows an axial section of the specimens, with dimensions in inches and decimals.

Each specimen was pulled until it broke in one of the grooves, after which the broken ends were threaded and heads screwed on for the second test, and in the same manner for the third. Below is the result giving lbs. per sq. in. of section at which they broke in each groove:

Specimen.	Rectangular groove.	Curved.	V-shaped.
No. 1.....	56,921	.....	.....
No. 2.....	54,606	.....	.....
No. 3.....	.....	.....	55,798

Specimen.	Rectangular groove.	Curved.	V-shaped.
No. 1.....	.....	.....	61,679
No. 2.....	.....	.....	59,983
No. 3.....	61,114	.....	.....

Specimen.	Rectangular groove.	Curved.	V-shaped.
No. 1.....	67,621
No. 2.....	66,772
No. 3.....	67,055

These experiments were very carefully and impartially made, and would seem to establish the superior strength of one form, and to leave the relative weakness of the other two in doubt.

I must say, however, in view of my experience in testing iron, that I should be unwilling to base any very decided opinion upon so limited a number of experiments, and will explain that we were only prevented by pressure of other business from making them more comprehensive.

It is well known that long bars will not stand so great a tensile strain as short specimens, and the reason is not obscure, as there is probably no iron absolutely homogeneous, and a bar is of course no stronger, as a whole, than its weakest section. In cutting out a test piece, the probabilities are very much against encountering that weakest section.

Some of your readers may have fuller data which they can communicate on these subjects.

C. SEYMOUR DUTTON.

WOLCOTT, N. Y., June 17, 1876.

In connection with the above, our readers will be interested in the following article, which we take from *The Iron Age*, giving the results of comparative tests of Low Moor, Burden's best and Henderson's patent irons, recently made in this city:

"Comparative tests, transverse and tensile, have recently been made in this city, at the School of Mines, Columbia College, with Low Moor, Burden's best and Henderson's patent irons, under the direction of Professor Roberts, C. E. and E. M. Mr. Harrison, of Newark, N. J., and Mr. J. L. H. Mosler, of this city, were present at these trials, and the latter has kindly furnished us with the following details of the results obtained:

Specimen.	Low Moor.	Burden's.	Henderson's.	TENSILE TESTS.				TRANSVERSE TESTS.			
				Length.	Area.	Stress.	Strain.	Length.	Area.	Stress.	Strain.
No. 1.....	12	12	12	12	12	12	12	12	12	12	12
No. 2.....	12	12	12	12	12	12	12	12	12	12	12
No. 3.....	12	12	12	12	12	12	12	12	12	12	12
No. 4.....	12	12	12	12	12	12	12	12	12	12	12
No. 5.....	12	12	12	12	12	12	12	12	12	12	12
No. 6.....	12	12	12	12	12	12	12	12	12	12	12
No. 7.....	12	12	12	12	12	12	12	12	12	12	12
No. 8.....	12	12	12	12	12	12	12	12	12	12	12

"The test of Henderson's iron was discontinued after reaching 12,000 pounds per square inch with no signs of fracture. In the Low Moor test, there were seven fractures at $\frac{1}{2}$ inch deflection, varying from three-sixteenths inch to half inch in depth. In the Burden test, there were six perceptible fractures, varying from one-eighth inch to three-eighths inch. Low Moor was affected by granulation about 50 per cent., Burden's best about 25 per cent., while Henderson's presented the least possible traces of granulation on the tensile fracture.

"The most important test, and the one which will most interest carriage builders, was the transverse test of carbonized subjects, which were 12 inches long, seven-eighths inch square at 10 inches suspension, the results of which are shown in the tabular statement below.

Specimen.	Low Moor.	Burden's.	Henderson's.	TENSILE TESTS.				TRANSVERSE TESTS.			
				Length.	Area.	Stress.	Strain.	Length.	Area.	Stress.	Strain.
No. 1.....	12	12	12	12	12	12	12	12	12	12	12
No. 2.....	12	12	12	12	12	12	12	12	12	12	12
No. 3.....	12	12	12	12	12	12	12	12	12	12	12
No. 4.....	12	12	12	12	12	12	12	12	12	12	12
No. 5.....	12	12	12	12	12	12	12	12	12	12	12
No. 6.....	12	12	12	12	12	12	12	12	12	12	12
No. 7.....	12	12	12	12	12	12	12	12	12	12	12
No. 8.....	12	12	12	12	12	12	12	12	12	12	12

"In the tests of Low Moor and Burden's the fracture occurred as a gentle yielding, while with the Henderson iron it was a sudden fracture and without warning, as occurs in breaking a bar of fine steel. The Henderson, at a strain of 9500 pounds, under the magnifier showed no signs of fracture. The carbon had penetrated the Low Moor about .05 inch, Burden's about .07 inch, and in the Henderson iron the dividing line between the carbonized and normal iron was barely perceptible, so finely were the colors of bright gray (carbonized) and cold gray (normal iron) blended.

"If these tests and tables are correct—and we believe that they are—we then have two grades of American iron, made from American ore, which show themselves superior in the test to the celebrated English Low Moor iron, and all that is now required to conclude the controversy is practical test at the forge, which, if agreeing with the above, must clearly show that "Burden's Best" and "Henderson's Patent Iron" are the best to employ in the construction of carriages.

"The Tomlinson Spring Company, of Newark, N. J., at whose suggestion the above tests were made, deserves much credit, their object being to ascertain the comparative fitness of the three kinds of iron above named for making carriage axles, and the result must be equally interesting to all axle or carriage makers.

"The tests were made on a Fairbanks machine, so finely constructed that each pound of pressure was duly indicated, and, to avoid any unfairness, the irons were marked 'A,' 'B,' 'C,' and it was not until the tests were completed that the parties engaged were aware of the grades of iron with which they had been experimenting."

The Origin and Progress of Industrial Exhibitions.

BY HUGH W. SWENTY.

(Continued.)

Without dwelling too long on details, it may be well before passing on to halt for a few moments and let facts and figures tell their own story of success. The building covered over 20 acres, its length in feet corresponded with the year of its erection, being 1851; it cost £198,168. 10/3—the twopenny is a triumph of financing—it was open 5 months and 15 days; it produced £506,100. 6/11; the surplus, an exhibition alone that never has flowered since, was about £186,000; the total number of visitors was 6,039,195, and the total receipts, both at the door and from season tickets, amounted to no less than £423,792. 4/7.

The aggregate number of exhibitors was 13,937, of whom Great Britain contributed 6861; the Colonies, 530, and the rest of the world, 6556. Persia furnished 12; China, 30; Greece, 36, and Denmark, 39, to this array, a remarkable contrast to their muster roll in subsequent exhibitions. The estimated value of the contents was £1,781,929. 11/4, of which the proportion set down to Great Britain and her Colonies amounted to no less than £1,111,508. 19/9, exclusive of the priceless spoil of the "old Lion of the Punjab," the historic and matchless Koh-i-noor.

The awards consisted of the Council Medal, ranking with a diploma of honor, the Prize Medal, and a Certificate of Honorable Mention, distributed as follows: Council medals, 171; prize medals, 294; and honorable mentions, 2123.

The glass and iron mode of construction has since made the circuit of the globe; New York in 1853, the "second edition," revised and improved, at Sydenham in 1854, the miniature copy at Melbourne, and the Glas Palace at Munich in the same year, the Dublin exhibition of 1865, the Palais Van Volkswyrt at Amsterdam in 1869, were all modifications of the great example of 1851, while the experience of a quarter of a century has suggested no more fitting materials than iron and glass for the Industrial Building of 1876.

But the great exhibition did not alone endure in its prototypes or in a series of world's fairs; all these are but a means to an end; its true monument is to be found in its offspring, South Kensington Museum and its compere; by their means the blossoms of one display have become the fruits of the next; the taste for the beautiful, by their example, has been spread broadcast all over the earth, and art has become the ally and not the antagonist of industry.

Not this alone, but in the words of the princely founder, we begin at length to realize how much the world is a gainer "by peace, love and ready assistance, not only between individuals, but between the actions of the earth," and slowly but surely draw near to "that great

end to which all history points, the realization of the unity of mankind. Not a unity which breaks down the limits, and levels the peculiar characteristics of the different nations of the earth, but rather a unity, the result and product of those very national varieties and antagonistic qualities."

South Kensington Museum may be regarded as an A B C of art (the number of visitors from its beginning show at the present day an aggregate of nearly 15,000,000), barely tolerated at first, laughed at by those who regard every innovation with the same eyes as Hollanders look on an incipient fissure in a dyke, and possibly for a similar reason, as the tide of popular feeling has gradually opened up the chink it had made in the dam of ignorance, and now the waves of art culture have spread over and fertilized the land. It was said, look at your buildings, is that your boasted taste? and indeed the "Brompton Boilers" were but a rude Lusk for so sweet a kernel, but, as the proverb says, "Rome was not built in a day," so it required time for the truth to triumph; now the cabinet is worthy of the gems, and of no institution in our land are Englishmen more proud than of our great Art Museum. It was the schoolmaster at home; it taught the masses through their eyes, its nucleus consisting of gifts and purchases to the extent of £9000 from the exhibition of 1851, but by bit it was built up, treasure by treasure it was added to, no large sums were voted for it; here was a purchase, there a gift or a bequest, until in this present day it recalls in many features the Green Vaults of Dresden or the Imperial Treasury of Vienna. It was the first to realize the fact that for women there were other occupations than the needle, whether that of the little steel stiletto, the sewing machine, or the telegraph, and the results are everywhere apparent, in the porcelain of Minton, in the black and white designs of the Illustrated papers, in the "Roll Call" and the "Quatre Bras" of Miss Thompson.

Every age has had its collectors, but also its dispersers, the hammer of the auctioneer has been as fatal in its effects as that of the iconoclast; the sale of a week has dispersed the accumulation of a lifetime, or under every favorable circumstance the besom of the housemaid has been frequently as destructive as the playful gambols of "the domestic cat" or the fire caused by the melting pot of the plumber. All that is now, humanly speaking, a thing of the past; treasures of bygone art are massed together, not to be separated again until an invader finds London "a pleasant city to sack," while still more has been effected, the fact that the millions appreciate their property has moved the possessors of stored up artistic wealth liberally to contribute of their abundance, and thus make the beggar wealthy as the king, for both can but enjoy.

Loan collections have become an institution, that of 1862 was a rival even to its mighty neighbor, with such relics as the distaff of Marie Stuart, the mitre of a Beckett, and the cap of good, brave Sir Thomas More. Since then history has been taught more effectively by the loan collection of historical portraits in 1866, '67 and '68 than by a course of Hume and Smollett washed down by Macaulay. In the first year were shown portraits from the earliest periods to 1688, many as apocryphal as the Gallery of Kings at Holyrood, but including such genuine works as the Chandos and Lumley Shakespeares, and illustrating thoroughly the great (great in its literature) Elizabethan age. A minor poet has chronicled this exhibition well in some verses, two of which run thus:

Great Eliza had a fancy for being painted very often,
With her silk brocaded dresses, stuffs and jewels passing rare,
But though Spenser praised her beauty, not all Holbein's skill could soften
The dark frown upon her features, and her concentrated stare.

Then there's winsome Marie Stuart, and though some say stain of sinning
Cast its shadow on the fairest flower that the
White Rose gave to earth,
I would hold my youth's allegiance and believe that
one so winning
Was as pure as she was noble, and as gentle as her birth.

The second carried one on from our Revolution through "the tea-cup days of hood and hoop, and, when the patch was worn," through bespattered Bolingbroke; gentle Dickey Steele; Pope, that note of interrogation, crooked in mind as in body; kindly Addison: lazy Thomson; burly Johnson; gossiping Boswell; "Pamela" Richardson, the great Dean; witty Sterne; Oliver Goldsmith (he needs no pet epithet); Burke who roused the nations and sent the Commons to sleep; Sheridan, wit, statesman, orator and dramatist; Burns, plowman, poet and patriot; Chatham, Charles James Fox, "the divine William" of his friends and "bottomless Pitt" of his enemies; Curran, Grattan, Wilberforce, whose fame survived through his gifted son; William Hogarth, Gainsborough, Sir Joshua, Watts, all of whom, children of the eighteenth century, serve to relieve the monotonous mediocrity of a stupid and inglorious era. The third exhibition, in 1868, took up "the story of our island song" to the previous year, and, *courtesy*, though we may laugh with "gentle Goldy," and say with him ancient great Twainy and his patent iron, "no age so great and no times so important as ours," there is little doubt that this our nineteenth century will come forth triumphantly from the unimpassioned criticism of future times, who so bold as to deny that Byron, Coleridge (whose name yet survives in writs as well as writings, and whose successors go far to disprove the old theory that brains do not descend), Brougham, Canning, noble sire of noble son; Scott, Keats, Southey, Tom Moore, Shelley, Hood, Campbell, Macaulay, Rogers; the pen-Hogarth of our day, Charles Dickens; Thackeray; the kindly-hearted satirist, Jerrold; Turner, Wilkie, Wellington, Nelson, the Napier, the Lawrences, Havelock, who "dead still keeps the realm he saved;" Outram the Bayard of India, the engineers Brunel, father and son; the Stephensons, Wedgwood and others who,

in diverse ways and by different means, have all striven to exalt our age, will survive as names of power, whose fame the English speaking world will not willingly forget. Nor was this allowed to be the mere sensation of a season, but, calling the attention of the nation to a national want, lent considerable aid to the permanent Valhalla of our worthies, the national portrait gallery.

Later on the public, both traveled and untraveled, have learned as much from the Meyrick Collection, as it could have from the Zwinger at Dresden, or the Ambras Gallery in the Lower Belvedere. 1873 saw three notable collections; the varied and cosmopolitan treasures of the Duke of Edinburgh, where the modern gold and silver work of Australia, the bronzes and lacquers of Japan, the "Kootenai" work of India, the "Kahlili" or Royal Standards of the Sandwich Islands, and the porcelain of the Flowery Land, egg shell, crackle, turquoise, *sang-de-bœuf* and *clair de lune* all were massed together; the collection of musical instruments which ranged from the organ tiger of Tipoo Saib to the spinet of Queen Elizabeth, and the monster bass viol of the Duke of Leinster; and finally the superb accumulation of jewelry.

In this last the art student could trace personal adornment down from the jewels of Queen Aahsept, the mother of King Aahmes, who founded the 18th dynasty eighteen hundred centuries before Christ, and was not only coeval with Abram and Sarai, but was the identical Pharaoh who was "plagued with great plagues because of Sarai, Abram's wife," and who was contemporary with the expulsion of the Shepherd Kings. On went the list through the cunning handicraft of the Greek and Etruscan periods, to the massive forms of old Rome and the delicate art of the gold workers of Tarentum, till it passed into the Cinque Cento, and on to the revival of Benvenuto Cellini and the tasteless garnishiness of the age of Roccoco. Here too were historical tokens, such as the Darnley jewel, made about 1576 for the Lady Mary Douglas in memory of her husband, Regent of Scotland; a reliquary of Catherine of Braganza; a pendant of another Queen and Catherine yclept Parr; the sapphire ring thrown from the window by Lady Scrope, that was borne northward by relays of horses as fast as the beacon flash that told of the coming of the Armada, and that welcomed the first of the Stuarts to the throne of the last of the Tudors; the gift to his Queen from the lion hearted Drake, and the misal cover of Henrietta Maria, unhappy daughter of an unhappy sire, Henri Quatre, a more unhappy mother, Marie de Medicis, and wife and widow of a most unhappy king.

1873 saw a collection of needlework, rich in art and historical interest; copes, chasubles, stoles and maniples, the pall of Sir William Walworth, the baby linen basket wrought by his mother for James the First, and the baby linen, never needed, worked by Elizabeth for her sister Mary. Then later the offshoot of South Kensington, Bethnal Green, laid open to the teeming masses of London an art academy for the million in the unrivalled cloisonnerie, the bronzes and the masterpieces of Rembrandt, Van Dyck, Greuze and Meiszonier lent by the liberal minded Sir Richard Wallace. But South Kensington has done still more; at home not only has it put life into the dry bones of fossil art schools, and established flourishing schools of design in all our centers of industry, but abroad it has set the example followed in every country that pretends to civilization, and thus is in truth the ancestor of all the art industry museums of the world. To sum them up briefly, it is sufficient to name the Conservatory of Arts and Trades at Paris, the Museum of Industry at Brussels, the Museum of Art and Industry on the Stuben Ring at Vienna, with its treasury of the King of Hanover, the Magyar Ipar Museum at Budapest, the Art and Industry School of Carlsbad, the Museum of the Minister of Commerce for Schools of Art in Austria; the Brunn, Lemberg, Cracow and Reichenburg museums, for Moravia, Galicia, Poland and Bohemia respectively.

Then come the museums of Berlin, Konigsberg, Nurnberg, Munich, Karlsruhe, Cassel, Hanover, Hanau, Hamburg, Leipzig, Stuttgart, Darmstadt, and that of quaint old Lubek, whose merchants once made the proud boast,

You can want no more, I'll swear,
Than the honor of a Lubeker.

Running through the list we find "Auld Reekie" with its museum, rich in Icelandic art lore, Celtic, Danish and Gothic relics, Stockholm, Milan, Turin and Florence, St. Petersburg, Moscow and Helsinki; and across the Atlantic, the Massachusetts Museum of Fine Arts in appreciative Boston. Even Turkey has its School of Industry at Constantinople, whilst Yedo has inaugurated a museum which only needs that Japanese works of by-gone days should be gathered together to make it an art bourse for the art workmen of the West. South Kensington is the parent acorn of all these oaks; it set the primal example, and to the world's fair of '51 it owes existence. To it and to its founder the world owes a debt beyond all monument. As for the benefits that the art industry of every country have derived from these several museums, they are patent, and manufacturers everywhere agree that for the future in the marts of the world commerce must go hand in hand with taste.

In 1852 came a lull after a tempest of success, and, as "when a well-graced actor leaves the scene, the eye but idly follows him that enters next," so the Cork Exhibition, held in the Corn Exchange, by "the pleasant waters of the River Lee," did not receive the full meed of merit it undoubtedly deserved. Still, as the daily admissions marked the number of 74,995 in the total, and the admissions by season tickets numbered no less than 54,936, for a provincial display it must be pronounced a success.

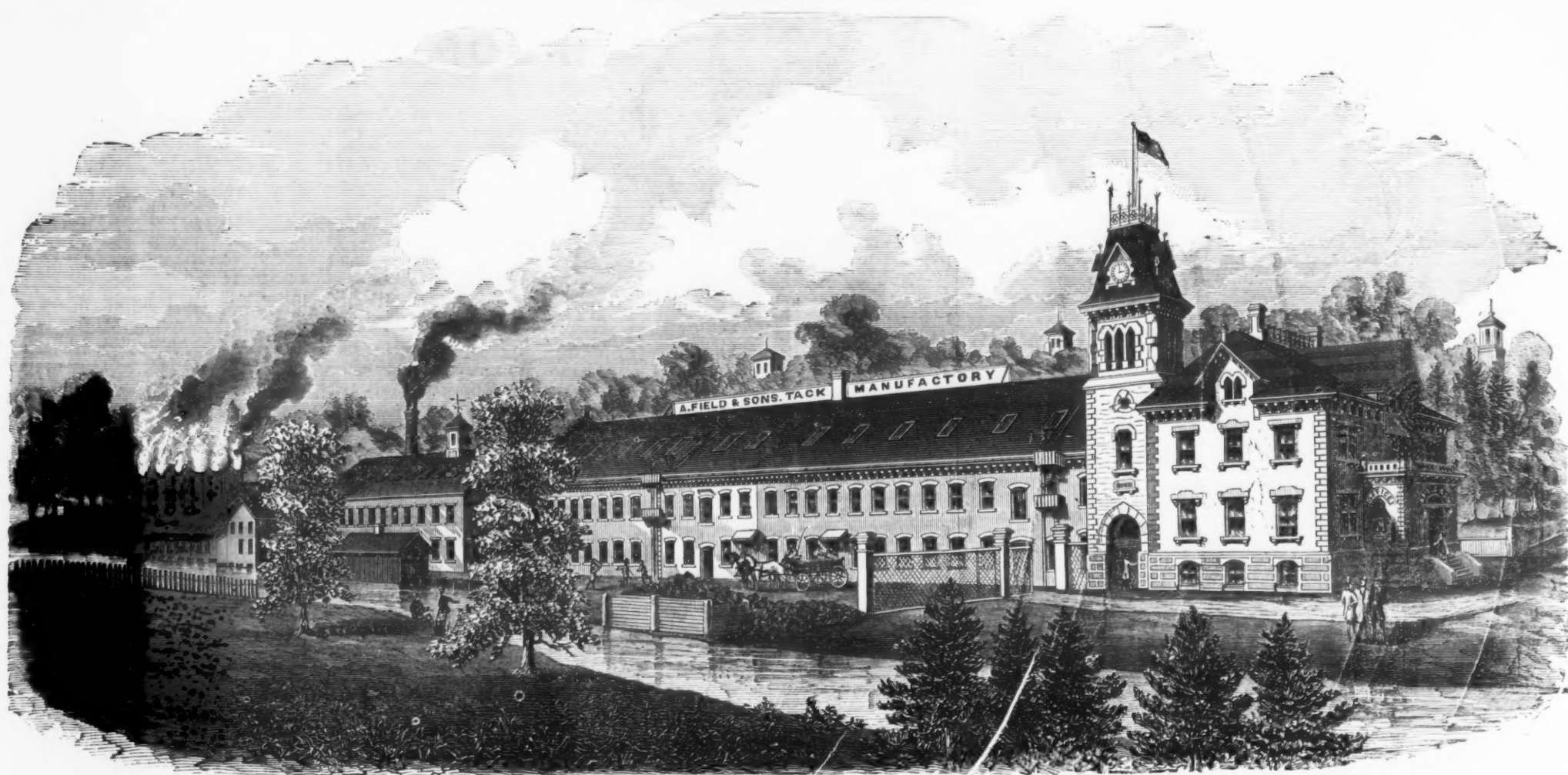
steel, I append a copy of a chemical analysis of two specimens of this iron. I am accustomed to recognize only as steel such specimens as show a finely crystalline fracture:

ANALYSIS OF UNITED STATES BRAND IRON BY PROF. GEORGE HAY, ANALYTICAL LABORATORY, ALLEGHENY CITY.

	Plate.	Bar.
Iron.....	99.421	99.710
Combined carbon.....	.083	.096
Graphitic carbon.....	trace	minute trace
Silicon.....	.062	.052
Sulphur.....	minute trace	.001
Phosphorus.....	.063	.071
Manganese.....	.029	.069
Aluminum.....	minute trace	minute trace
Copper.....	.003	.003
Minute traces of other matter, loss, etc.....	.019	.018

I also transmit the result of some experiments made by Mr. Uber and myself, bearing upon a question recently mentioned in *The Iron Age*—

ESTABLISHED 1827.



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CIGAR BOX
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HOB
SILVERED OR JAPANNED LINING
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COLORED COATED CARPET
COFFIN LINING
MINERS'
BRUSH
LOOKING GLASS
SHOE OR LASTING
ROUND HEAD
ROOFING
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BOAT REGULAR
BOAT CHISEL POINTED
FINE TWO PENNY
FINE THREE PENNY
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The "Summer Queen" Petroleum Cook Stove.

We show in the accompanying illustrations a simple, practical and safe cook stove for burning petroleum oil. The discomforts of a hot coal fire in summer cannot well be described, and these are aggravated by the fact that, once kindled, it cannot be extinguished until it has

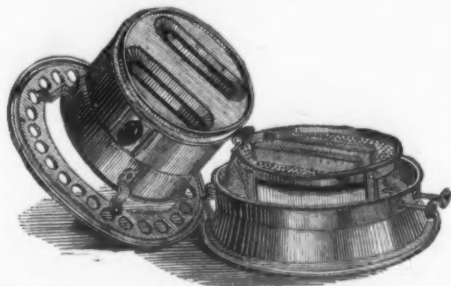


Fig. 1.



Fig. 2.

THE "SUMMER QUEEN" COOK STOVE.

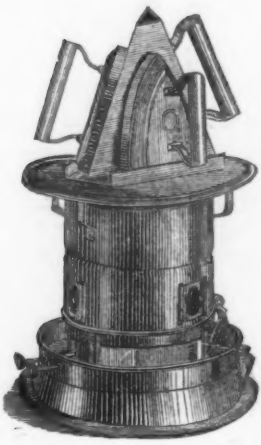


Fig. 3.

burned out and cooled down slowly. The gas stove, though somewhat costly to use, meets the requirements of a summer cooking apparatus in houses supplied with gas, especially where economy in the cost of fuel is not an important consideration; but an equally practical and vastly more economical substitute for coal is found in petroleum when burned under conditions favorable to complete combustion. The petroleum flame can be lighted in a moment; will do all that can be done over one hole of a cook stove; makes no dust or ashes; can be placed where it will be least in the way, and when not needed, can be extinguished at once.

Among stoves of this kind the Summer Queen possesses many conspicuous advantages. It is odorless, and makes neither smoke nor smell; it is so simple that the least intelligent servant can manage it with success; it is strong and durable, and cannot be injured by long continued good usage; it costs less than one cent per hour when in use, and will do everything which can be done with a coal or wood stove of equal surface. It is, moreover, absolutely safe. The wick tubes are surrounded with water, and the oil reservoir never approaches a temperature at which explosive gases are generated.

In our illustrations, Fig. 1 represents the stove with the top thrown back, ready for lighting. The lower reservoir is filled with oil, and the upper is half filled with water. Fig. 2 represents the stove with kettle. A gallon of water will boil in 16 minutes from the time the oil is lighted. Fig. 3 shows the stove with flat iron heater attached. By this simple device three irons are heated at once. These stoves are provided with capacious ovens, capable of roasting and baking as well as in a cook stove oven. Among the articles of necessary furniture is a broiler of excellent construction, which will broil a steak as well as it can be broiled over a bright coal fire. The Summer Queen is made single and double, and the single stoves come in four sizes. It is an article which, we are satisfied, meets a want, and which can be recommended to the trade as a seasonal novelty.

Bursting of a Water Tank in an English Hospital.

The Engineer (London), of recent date, gives the following account of a curious accident: A large water tank on the top of St. George's Hospital gave way recently with very disastrous results. As a careful inquiry will be made by competent engineers into the circumstances of the case, we, for the present, reserve the expression of our own opinions on the subject, and content ourselves with the publication of an accurate statement of the facts. At the proper time we shall deal with the questions involved, which are of very considerable importance. The tank which gave way was erected in 1869. It was 10 ft. square in horizontal section, and 12 ft. 6 in. deep; when full, it held 7500 gallons, and at the time of the accident it was being filled, but was said to be 4 ft. less than full, containing about 5000 gallons, or, in round numbers, 25 tons of water. It was constructed of cast iron plates, 3 ft. square, with machine-planed edges and internal flanges, secured by bolts and nuts, the corner pieces being rounded to a 6 in. radius. It was stayed with direct stays across the tank, between the flanges on opposite sides, and was supported on wrought iron girders, at about 8 ft. above a lead, flat on the top of the hospital. It was supplied with water from an artesian well at the hospital. On Saturday morning, at about eleven o'clock, water was seen to be coming through the ceiling of one of the wards under the tank. The superintendent, Mr. Todd, and the engineer employed to attend to the boilers and mechanical apparatus in the hospital, immediately proceeded to the roof, and observed a jagged crack on the eastern side of the tank, from which water was flowing freely. Without a moment's delay the engineer proceeded to draw the waste plug, but he had scarcely accomplished this before the crack suddenly extended, gaped open, and the two lowest tiers of plates of the eastern side of the tank blew out with twenty-three tons of water behind them, fell on to and passed through the roof, 3 ft. or 4 ft. below the tank bottom, then, gaining velocity, the combined mass of tank plates and water and debris, swept downward successfully through the floors of two wards into the student's room on the ground floor. Two patients were carried down from the upper and three from the lower ward by the catarract. In the student's room were several

students. All the patients who were carried down were very severely injured, as were also three of the students, while several patients were struck by the falling debris and much hurt; but the escapes were marvelous, and it is astonishing that none of the injuries in such a terrible catastrophe have terminated fatally. A second after the crash the chimneys of the several wards affected belched forth volumes of soot and smoke, no doubt in consequence of the compression of the air caused by the in-

duced current set up by the falling water. It is worth notice that the tank had been regularly filled, and that on the morning before the accident no trace of weakness was manifested, although the tank was submitted to a strain of 2 lbs. or so on the square inch in excess of that which it had to bear at the moment when it gave way. We may add that settlement of the bearers had nothing to do with the catastrophe, as the supports on which the tank rested remain perfect in every respect.

Special Notices.

HOBOKEN, June 30, 1876.
The undersigned, being directed by the Chancellor of New Jersey to offer for sale the vessel known as the Stevens Battery and the material thereto belonging, now lying at Hoboken, New Jersey, would hereby invite proposals for the purchase of said vessel, to be addressed, Stevens Battery, Office of the Hoboken Land and Improvement Co., Hoboken, N. J., and to be delivered at the said office on or before noon of July 17th, reserving the right to reject any or all bids if not deemed advantageous, and the acceptance of any bid being subject to the approval of the Chancellor. The terms of sale will be, one-quarter cash and the balance upon the removal of the vessel; subject to the approval of the Chancellor. The vessel will be open to the inspection of bidders, and further information will be given upon inquiry of Prof. R. H. Thurston, of the Stevens Institute, or at the office of the Hoboken Land and Improvement Co., No. 3 Newark St., Hoboken, N. J. Bidders can receive at said office information as to the terms upon which the land and shops adjoining the Battery can be leased for the term of one year.
Signed, FITZ JOHN PORTER,
BENJ. G. CLARK,
W. W. SHIPPEN,
S. B. DOD.

ATTENTION is invited to the fact that the Labels used on my Goods, were entered according to Act of Congress in the year 1876, in the U. S. Patent Office.
IN ADDITION to a full line of Extension Lip, Car, Machine, Dowel and Hand Rail Bits, also of Boring Machine, Carpenters' and Millwrights' Augers. All my goods are solid CAST STEEL, and perfectly made by means of my Patent Machinery.
DEEP RIVER, Conn., Sept. 7, 1874.

SPECIAL NOTICE.

I have three patents for Dies, Machinery, and Tools for making Augers and Bits, each running seventeen years; dated as follows: Dec. 19, 1862; January 31, 1866, and July 3, 1866. There is a special claim on each of the Dies. All persons infringing on said patents will be held responsible to the extent of the law.
RUSSELL JENNINGS.
DEEP RIVER, Conn., Sept. 7, 1874.

SPECIAL NOTICE.

S. QUITERMAN,
EXPORT & COMMISSION MERCHANT,
No. 2 Aldermanbury Fountain Court,
LONDON, E. C.
New York Office, QUINTERMAN BROS., 454 Broadway.
Best Attention Given to the Introduction into all Markets of Europe of my Wares, Merchandise, Patents, &c.

NOTICE! POND'S TOOLS.

The undersigned has assumed the Personal Property, including accounts, finished and unfinished Machinery, good will &c., connected with the manufacture of MACHINIST'S TOOLS as conducted by Mr. Lucius W. Pond since 1847, and will continue the said business at the old stand, cor. Union and Exchange Sts., Worcester, Mass., under the name of DAVID W. POND, Successor to Lucius W. Pond.
CARD.—Having assumed the business mentioned above, I solicit Inquiry and Patronage, with guarantee that present standard of Workmanship, and quality of Machinery shall be maintained. A large quantity of New and Second-Hand TOOLS, ALL STYLES AND SIZES, For Sale at Low Prices. Send for list of second-hand tools. Store at 98 Liberty St., New York, will be discontinued from Feb. 1, 1876, and all sales made from manufactory.
Respectfully,
DAVID W. POND,
Successor to Lucius W. Pond.

DISSOLUTION OF COPARTNERSHIP

The firm of McClellan & Hymes is this day dissolved by mutual consent. The business of the firm will be liquidated by M. McClellan alone, No. 130 Liberty Street.
M. McClellan,
D. HYMES.
NEW YORK, Jan. 30, 1876.

Special Notices.

SPECIAL NOTICE.

Having established ourselves in business in this city for the sale of

AMERICAN HARDWARE, HOUSE-FURNISHING GOODS, AGRICULTURAL IMPLEMENTS, Etc.,

we beg to solicit correspondence with parties desirous of being represented by us in Germany and surrounding countries.

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SILESIAN SHEET ZINC,
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TO INVENTORS AND MANUFACTURERS

The 4th Exhibition of the American Institute will open September 8th. Machinery will be received after August 14th, other goods after August 24th. Increased awards and a Special Gold Medal for this year. For particulars, visit the "General Superintendent American Institute, New York."

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a position as Rolling Mill Superintendent. Experience extending over 20 years in the States and Europe, and embracing all descriptions of rolled iron, including wire rods and wire drawing.

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Wanted,

By a practical man, a situation as manager over rolling mills. Has had many years' experience both as workman and manager, in some of the most eminent firms in England. Understands thoroughly the manufacture of all kinds of iron and steel, viz: boiler plate, rails, hoops, merchant iron, armor plate, Bessemer and puddled steel. First-class certificates as to ability, etc., can be shown. Refers to Mr. G. Gill, head superintendent at Hopkins, Guikes & Co.'s, Middlesboro-on-Tees, England; and to W. H. Brown, Neepend, Sheffield, England.

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Office of POPE, WILLIAMS & CO.,
CHATEAUGAY LAKE, May 1st, 1876.

We have placed the exclusive sale of our

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in the hands of Messrs. Naylor & Co., 99 John St., New York; 208 South 4th St., Philadelphia; 6 Oliver St., Boston, who will hereafter act as our agents, and to whom all orders should be addressed.

Yours, truly,
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WANTED.—A situation by a practical double entry book-keeper. Would prefer a Rolling Mill, having had several years experience in that business. References satisfactory. Address
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CENTENNIAL EXHIBITION.

A young man, a native of this city, with good references, having had large experience in the Hardware Trade, offers his services in receiving, arranging and keeping goods in order during the exhibition. Terms moderate. Address,
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100 tons good Second-Hand T
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Cash paid for all kinds of Metals and Tools.

HALL & HARBESON,
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A thoroughly competent engineer, with extensive experience in the above line, desires employment.

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M.,
Office of *The Iron Age*, 10 Warren St., N. Y.

WANTED situation as foreman in a mechanical establishment, by a man 28 years of age, is a college graduate, has served a three years' apprenticeship at machinists' trade, and for past two years has been assistant draughtsman in water works construction. References as to ability and character. Address, **F. M. C., P. O. Box 263, Rochester, N. Y.**

Special Notices.

ROOFS.

Save time and money by sending for estimate for new or old buildings. Send for our 100 page Book (free if you write to-day), and learn how to stop leaks effectually and cheaply, save re-shingling, etc. Correspondence invited. S. Cedar St., N. Y., or 49 S. Front St., Phila. Mention *The Iron Age*.

JUST ISSUED.

EVERYTHING FOR THE
Seeds, Implements, Machinery, and Fertilizers.
New Catalogue, 200 Illustrations, mailed on receipt 10 cent stamp.
A. B. COHU,
197 WATER ST., N. Y.

FARM.

Important to Manufacturers.

BISSELL, WELLES & MILLET,
Auctioneers and Commission Merchants, No. 15 Murray St., New York.

Solicit from Manufacturers and others consignments of Hardware and Cutlery for our weekly Auction Sales to the Trade, or at private sale for cash, as desired. Our facilities for moving large lines of goods are unsurpassed. Advances made if desired.

Wanted,

A Foreman who has had practical experience in the construction of Architectural Iron Work; must understand draughting and figuring quantities. A permanent situation for a good steady man.

Address
H. W. BELDIN,
195 Reed St., Milwaukee, Wis.,
giving terms and references.

Wanted.

A man to keep a set of books and clerk in hardware store, or would sell a half or whole of stock. None but a practical hardware man need apply, and the best of reference must be given.

Address
S. L. McKISSON,
Des Moines, Iowa

WANTED.—A first-class business man familiar with machinery and manufacturing, capable of handling large bodies of men, desires a responsible position. References satisfactory. Address,
IRON AND STEEL,
Care of P. O. Box 813, Bridgeport, Conn.

DROP FORGINGS.

The TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of

Iron and Steel Drop Forgings

in quantities to order at reasonable rates.

HERMANN BOKER & CO., Proprietors,
101 & 103 Duane St., N. Y.

S. B. LOWE,
Chattanooga, Tenn.

Dealer in METALS AND ORES. Special rates of freight to all principal points in the United States and Canada.

TO LET,

A Light, Handsome Office.

Possession Immediately.

HERMANN BOKER & CO.,
101 Duane Street, N. Y.

HARDWARE.

FOR SALE in the best business part of Jersey City, a first-class Tool and Hardware business.

Established about 25 years, and doing a fair business.

Apply to
H. LUTGEN,
87 Montgomery St., Jersey City.

MANUFACTURERS

desirous of introducing their goods to the British and Continental Markets, are advised to insert advertisements in the newspaper "IRON," published every Saturday, at 99 Cannon Street, London, E. C.

SCALE: First 3 lines, 3/; every additional line, 10d. Price, 6d. per Copy, or 30/ per annum, inclusive of postage to the United States.

Steel Castings.

Solid and Homogeneous. Guaranteed tensile strength, 25 tons to square inch. An invaluable substitute for expensive forgings, or for Cast Iron requiring great strength. Send for circular and price list to
CHESTER STEEL CASTINGS CO.,
Evelina St., Philadelphia, Pa.

Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy.

A practical man with means is wanted to join a practical man who is already well established.

Address
CAR WHEEL FOUNDRY,
P. O. Box 134, Selma, Alabama.

Briesen's Patent Agency

FOR SECURING INVENTIONS, TRADE MARKS, &c., IN AMERICA AND EUROPE.

No. 258 Broadway, New York.

A. V. BRIESEN.

AFTER SEVERAL YEARS OF SUCCESSFUL experience in the construction of

New and Experimental Machinery,

we desire to invite the attention of manufacturers, and others wanting that class of work, to our facilities at Peckskill, N. Y., near the Hudson River Railroad depot, 18. 30m. from N. Y. City.

ANDERSON BROTHERS.

For Sale, &c.

For Sale.

No. 3, Fowler Punch and Shears with large assortment of dies and punches—cost \$800. Price, good order, \$325. Heavy Iron Shears, capable of cutting 8 in. square iron—cost \$900. Price \$400.

S. C. FORSAITH & CO.,
Manchester, N. H.

For Sale.

Magnetic Iron Ore For Sale.

1000 tons; contains about 60 per cent. iron; is suitable for making Bessemer steel; makes a fibrous iron; mill cinder may be worked with it to advantage. Delivery at any point on Lakes Ontario or Erie. Apply
J. M. MACHAR,
Kingston, Ontario, Canada.
See specimens from Machar Mine at Centennial.

For Sale Low.

Wire Straightener and Cutter.

This machine is nearly new, having been used but a few times. Connected with it is a machine for making hair pins. The whole will be sold for less than half its cost. Apply to or address
Wason & Kelso,
46 & 48 N. Front St., Philadelphia.

FOR SALE, at Taunton, Mass.

The Steam Engine Works known as the Foundry and Machine Co., consisting of all the Real Estate, Machinery, Tools and Patterns necessary for building Corliss Steam Engines, from 10 inch to 34 inch cylinder; also a full stock of Tools and Machinery for general job work. This property will be sold extremely low, either for the Machinery, Tools and Patterns to be removed, or the entire property. The city of Taunton offers superior advantages as a location for any kind of machine business, having a navigable river for receiving coal and iron. Two lines of railroad connected by steamers between New York and Boston; superior Western connection by railroad, and a large and intelligent manufacturing population. For further particulars or catalogue of machinery address

GEORGE A. FIELD,
Taunton, Mass.

Or **J. M. LEONARD,** Somerset, Mass.

Screw Factory For Sale.

By order of the Bondholders of the International Screw Nail Company, of New York City, there will be sold at Public Auction, Thursday, July 27th, 1876, at 10:30 o'clock, a. m., on the premises recently occupied by the said company, located in the so-called Bay State Village, in the town of Northampton, Mass., the following property to wit: All that tract of land containing about twelve acres, formerly owned and occupied by the said International Screw Nail Company, together with the buildings thereon, consisting of a brick mill 150x40 ft., three stories high and basement, and six dwelling houses; water privilege of about 60 horse-power, steam boiler and piping for heating the mill, and also the full equipment appertaining to said screw factory for the production of 1800 gross of screws per day, viz.: Headers, Shavers and Nickers, Threading, Patterns, Shafting, Belling, Machine Tools, Office Furniture, Fixtures, Patent Rights, &c., &c.

For catalogue, apply to

W. T. CLEMENT, Esq.,
Northampton, Mass.

Apply to
W. W. JONES,
Near the Lehigh Valley Railroad Depot,
Allentown, Pa.

FOR SALE.

An 1/2 inch mill train for making Merchant, Band and Hoop Iron. Will be sold cheap.

Apply to
W. W. JONES,
Near the Lehigh Valley Railroad Depot,
Allentown, Pa.

PATENT FOR SALE.

The Swiss Industrial Co., of Neuhausen, Switzerland, have invented an apparatus for heating and ventilating R. R. Passenger Cars, and offer their patent, dated May 26, 1876, for Sale.

Apply to
Mr. A. W. MANNEL,
88 Prince Street, N. Y.

FOR SALE.

TESTING MACHINE, built by the Son & Boston Iron Co., arranged for tensile and compressive strains, capacity 150 tons.

MILLING MACHINE, built by Brainard Milling Machine Co., cutters swing 28 inches diameter, and spindle set at right angles, which insure accurate work.

IRON ROOF, that covers New England Iron Co.'s Mill, 8 arches 80 feet span, posts 18 feet high, building now 80 feet wide by 90 feet long.

ROLLING TABLE, for straightening iron.

PUDDLE TRAIN, for Billets and 3, 4 and 6 inch Bars.

FIVE DRILLS.

CORRUGATING MACHINE, Complete.

CORRUGATED SHEET IRON and barbed Nails.

SMALL UPRIGHT ENGINE, 15 H. P., inch cylinder.

PUMPS, &c.

Apply to
WM. E. COFFIN & CO.,
8 Oliver Street, Boston.

Valuable Furnace Property and Mineral Lands FOR SALE.

The assignees of McKnight, Porter & Co. will offer at Public Sale, at Monticello, F. M. Co., Cowlitz, Wash. Station, Allgheny Valley Railroad, on Wednesday, July 19, 1876, at 10 o'clock A. M., that valuable property known as the

MONTICELLO FURNACE,

consisting of about three hundred acres of land, on which is erected a blast furnace, with all necessary buildings. Coal and ore banks contiguous.

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, July 5, 1876.
Owing to the holiday character of the past week, the financial markets have been very dull, and Wall Street has presented an almost deserted appearance. The money market has manifested a tendency to increased firmness, owing to the preparations for the July interest and dividend disbursements. The rate on call loans increased to 2½% @ 4 per cent. The discount on prime mercantile paper is 3¼% @ 5 per cent.

The gold market has been somewhat firmer this week, and the premium has advanced to 112½. There is still an important "short" interest, and 1 @ 2 per cent. is paid for carrying. The reasons for the advance are found in the threatening aspect of affairs in the East, the prospect of an increased specie export, the threatened repeal of the resumption act and other causes. Foreign exchange is strong. We give below the daily range of the premium since our last report:

	Highest.	Lowest.
Thursday.....	112½	112½
Friday.....	112½	112½
Saturday.....	112½	112½
Sunday.....	112½	112½
Tuesday.....	112½	112½
Wednesday.....	112½	112½

The bond market has been strong on the demands of investors, who are purchasing with the money disbursed in the July interest payments. All classes of investment securities have advanced, with a few exceptions. The demand for desirable first mortgage railroad bonds has exceeded the supply in the market. We give below the quotations of governments at the close of business to-day. In the stock market there has been an unusually active speculation, beginning on Wednesday of last week. The large dealings have extended to nearly all the shares on the active list, and prices, as the rule, have advanced. We give below the quotations of active shares at the close of business to-day.

The following tables show the foreign trade movements for the week, so far as reported:

IMPORTS.

For the week ended July 1:

	1874.	1875.	1876.
Total for week.....	\$5,107,480	\$6,698,188	\$3,486,548
Prev. reported.....	211,153,581	176,747,313	153,498,947

Since Jan. 1.....\$216,361,011 \$183,115,531 \$156,985,495

Among the imports of general merchandise were articles valued as follows:

	Quant.	Value.
Brass goods.....	5	\$171
Bronzes.....	13	2,988
Chains and anchors.....	4	116
Copper.....	4	254
Cutlery.....	17	4,439
Gas fixtures.....	1	671
Gun. pl. tou.	11	13,023
Iron, pl. tou.	5	861
Iron, sheet, tou.	5	1,080
Iron tubes.....	636	619
Iron, other, tou.	11	23,710
Lead, pl. tou.	4,025	3,796
Lead, other, tou.	68	2,046
Metal goods.....	68	6,796
Nails.....	2	679
Needles.....	4	2,447
Old metal.....	1	1,680
Plating.....	1	371
Saddlery.....	1	86
Steel.....	455	3,579
Tie, boxes.....	22,376	22,376
Tin, 2896 slabs.....	301,014	22,668
Wire.....	244	244
Zinc.....	109,150	6,731

EXPORTS OF SPECIE.

For the week ended July 1:

	Total for the week.....	Previously reported.....
	\$3,185	\$2,167,950

Total since Jan. 1, 1876.....\$2,171,135

Same time in 1875.....\$3,771,104

Same time in 1874.....\$2,065,819

Same time in 1873.....\$1,962,011

Same time in 1872.....\$35,131

Government bonds close as follows:

	Bid.	Asked.
U. S. Currency 68.....	126	127
U. S. 6, 1881, reg.....	119½	120½
U. S. 6, 1881, con.....	120½	121½
U. S. 5-30 1882, reg.....	116½	117½
U. S. 5-30 1882, con.....	116½	117½
U. S. 5-30 1885, new reg.....	117½	118½
U. S. 5-30 1885, con.....	117½	118½
U. S. 5-30 1887, reg.....	119½	120½
U. S. 5-30 1887, con.....	119½	120½
U. S. 5-30 1890, reg.....	121½	122½
U. S. 5-30 1890, con.....	121½	122½
U. S. 10-40 reg.....	118½	119½
U. S. 10-40 con.....	118½	119½
U. S. 5, 1881, reg.....	117½	118½
U. S. 5, 1881, con.....	117½	118½

The following were the closing quotations of active shares:

	Bid.	Asked.
Atlantic & Pacific R.R. Preferred.....	18½	19
Atlantic & Pacific Telegraph.....	18½	19
Chicago & Northwestern.....	42½	43
Chicago & Rock Island and Pacific.....	109½	110
Chic. & Ind. Cent.....	115½	116
Chic. & Ind. Cent.....	115½	116
Clev. Col. C. & Ind. Cent.....	44	45
Cleveland and Pittsburgh.....	102	103
Chicago & Alton.....	108	109
Chicago and Alton Preferred.....	108	109
Consolidation Coal.....	30	31
Canton.....	30	31
Del. Lack. and Western.....	106	107
Delaware & Hudson Canal.....	106	107
Adams Express.....	109½	110
American Express.....	58½	59
United States Express.....	74½	75
Wells, Fargo & Co. Express.....	84	85
Eric.....	14½	15
Harlem.....	139½	140
Hannibal & St. Joseph.....	14	15
Illinois Central.....	23½	24
Kansas & Texas.....	98½	99
Lake Shore.....	59	60
Michigan Central.....	51½	52
Morris & Essex.....	101½	102
Milwaukee & St. Paul.....	113½	114
Mariposa.....	8½	9
New York Central.....	109½	110
New Jersey Central.....	75½	76
New Jersey Southern.....	1	2
Ohio & Mississippi.....	17½	18
Pacific Mail.....	30½	31
Panama.....	140	141
Pittsburgh & Fort Wayne.....	101½	102
Pacific of Missouri.....	7	8
Quicksilver.....	13	14
St. L., Kan. City.....	18	19
St. L., Kan. City.....	24½	25
Tol., Wash. & Western.....	2½	3
Union Pacific.....	61	62
Western Union Telegraph.....	71	72

GENERAL HARDWARE.

Owing to the long holiday, from Saturday afternoon, July 1st, until this morning, but little business has been transacted in Hardware circles since we last went to press. The manufacturers of Strap and T Hinges have not yet issued their circulars, but as far as we can learn these goods are firmly held by the makers at the advanced quotation noted last week.

The incidents connected with the failure of John Nazro & Co., of Milwaukee, having excited considerable inquiry, we deem it advisable to state a few of the leading facts for the information of those interested. Mr. Nazro had always claimed to have abundant resources in his business, and his request for a long extension made in Sep., 1875, was unexpected and unsatisfactory. It was granted, however, and as a surplus of \$135,000 was shown no serious apprehension was entertained of his ability to meet his extended paper. The first notes of this extension matured in March, 1876, and to the surprise of the holders were dishonored, and a proposition was received from Nazro & Co. to compromise their whole debt at 33½ cents on the dollar. A meeting of the New York creditors was called, and one of their number deputed to go to Milwaukee to inquire into the causes of such enormous deficit. The results of that mission not being satisfactory, the New York creditors resolved to get other creditors to unite with them in putting the estate into bankruptcy. This effort, although strongly opposed, was successful. Mr. Nazro applied at the same time for a deed of composition in bankruptcy, but not having the requisite number and amount of his creditors, his petition was denied. The New York creditors now felt themselves secure in the accomplishment of their plans, but Mr. Nazro having secured an adjournment of the vote for appointment of assignees went to Wheeling and Pittsburgh with letters of credit from his friends, and succeeded in buying up so many of the claims against him as to give him a clear working majority in the vote for assignee. As this was considered by the New York creditors as putting the management of affairs entirely beyond the control of the petitioners in bankruptcy, they gave up the contest and accepted the proposed compromise.

Foreign Hardware is without any special feature of interest. We have received the following circular which explains itself:

New York, June 29, 1876.
Some boastful American Screw Makers, claiming a scarcity of these goods (probably from the insufficiency of 150 per cent. protective duty), the subscriber assures his customers he has an assortment for sale at the following discounts:

Flat Head Wood Screws Iron and Brass 55% Round " " " " 45% Nuttall Screw Hooks, Eyes, &c., 70 & 10% Special rates for orders for exportation. Terms, cash within 30 days from date of invoice. Prices subject to changes of the market without notice. Yours, respectfully,

Geo. W. Bruce, 11 Platt street.

At the meeting of the Stamped Ware Manufacturers' Association, held in this city last week, the discount from the list of Common Stamped Tinware was changed from 10 to 15 per cent. The price of Deep Stamped Ware remains as before.

Graham & Haines have been appointed sole agents for Tucker's Alarm Money Drawers, and they carry a stock of these goods at their warehouse, No. 113 Chambers street.

The Russell & Erwin Manufacturing Company continue to quote Flat Head Iron Wood Screws at discount 62½ per cent., terms cash, 30 days.

We have received the following circular:

New York Office of THE DOUGLASS MANUFACTURING CO., No. 62 Broadway, New York, July 1, 1876.

To the Hardware Trade: We respectfully offer our reduced list of Cook's Cast Steel Augers and Bits. Discounts remain unchanged.

THE DOUGLASS MANUFACTURING CO. Cook's Cast Steel Carpenters' Augers.

Inch..... ¼ ½ ¾ 1 1 ½ 2 2 ½ 3 3 ½ 4 4 ½ 5 5 ½ 6 6 ½ 7 7 ½ 8 8 ½ 9 9 ½ 10 10 ½ 11 11 ½ 12 12 ½ 13 13 ½ 14 14 ½ 15 15 ½ 16 16 ½ 17 17 ½ 18 18 ½ 19 19 ½ 20 20 ½ 21 21 ½ 22 22 ½ 23 23 ½ 24 24 ½ 25 25 ½ 26 26 ½ 27 27 ½ 28 28 ½ 29 29 ½ 30 30 ½ 31 31 ½ 32 32 ½ 33 33 ½ 34 34 ½ 35 35 ½ 36 36 ½ 37 37 ½ 38 38 ½ 39 39 ½ 40 40 ½ 41 41 ½ 42 42 ½ 43 43 ½ 44 44 ½ 45 45 ½ 46 46 ½ 47 47 ½ 48 48 ½ 49 49 ½ 50 50 ½ 51 51 ½ 52 52 ½ 53 53 ½ 54 54 ½ 55 55 ½ 56 56 ½ 57 57 ½ 58 58 ½ 59 59 ½ 60 60 ½ 61 61 ½ 62 62 ½ 63 63 ½ 64 64 ½ 65 65 ½ 66 66 ½ 67 67 ½ 68 68 ½ 69 69 ½ 70 70 ½ 71 71 ½ 72 72 ½ 73 73 ½ 74 74 ½ 75 75 ½ 76 76 ½ 77 77 ½ 78 78 ½ 79 79 ½ 80 80 ½ 81 81 ½ 82 82 ½ 83 83 ½ 84 84 ½ 85 85 ½ 86 86 ½ 87 87 ½ 88 88 ½ 89 89 ½ 90 90 ½ 91 91 ½ 92 92 ½ 93 93 ½ 94 94 ½ 95 95 ½ 96 96 ½ 97 97 ½ 98 98 ½ 99 99 ½ 100 100 ½ 101 101 ½ 102 102 ½ 103 103 ½ 104 104 ½ 105 105 ½ 106 106 ½ 107 107 ½ 108 108 ½ 109 109 ½ 110 110 ½ 111 111 ½ 112 112 ½ 113 113 ½ 114 114 ½ 115 115 ½ 116 116 ½ 117 117 ½ 118 118 ½ 119 119 ½ 120 120 ½ 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Mortise Knob Locks.		
Wrought Iron Inside Work. Reverse by removing Cap.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 960, 3 1/2 in.	\$6.30	\$4.50
No. 960 1/2, 3 1/2 in.	7.50	6.00
No. 964, 4 in.	7.00	5.50
No. 964 1/2, 4 in.	8.50	7.00

Builders' Mortise Knob Locks.		
Rack Tumbler, Wrought Iron Inside Work. 24 Changes. Reverse by simply pulling forward and turning half round.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 995, 3 1/2 in.	\$8.50	\$7.50
No. 996, 3 1/2 in.	10.50	9.50
No. 997, 3 1/2 in.	12.50	11.50
No. 998, 3 1/2 in.	14.50	13.50
No. 999, 4 in.	9.50	8.50
No. 1000, 4 in.	11.50	10.50
No. 1001, 4 in.	13.50	12.50
No. 1002, 4 in.	15.50	14.50
No. 1011, 4 1/2 in.	10.50	9.50
No. 1012, 4 1/2 in.	12.50	11.50
No. 1013, 4 1/2 in.	14.50	13.50
No. 1018, 4 1/2 in.	16.50	15.50

Mortise Knob Locks.		
Rack Tumbler, Wrought Iron Inside Work. 24 Changes. Reverse by removing cap.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 970, 3 1/2 in.	\$8.00	\$7.00
No. 971, 3 1/2 in.	9.00	8.00
No. 972, 3 1/2 in.	10.00	9.00
No. 973, 3 1/2 in.	11.00	10.00
No. 974, 4 in.	9.00	8.00
No. 975, 4 in.	10.00	9.00
No. 976, 4 in.	11.00	10.00
No. 977, 4 in.	12.00	11.00
No. 978, 4 in.	13.00	12.00
No. 980, 4 1/2 in.	14.00	13.00
No. 981, 4 1/2 in.	15.00	14.00

Easy Spring Builders' Mortise Knob Locks.		
Two Springs to Latch. Wrought Iron Inside Work. Reverse by simply pulling Latch Bolt forward and turning half round.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 2500, 3 1/2 in.	\$6.50	\$6.00
No. 2501, 3 1/2 in.	8.00	7.50
No. 2510, 4 in.	7.50	7.00
No. 2511, 4 in.	9.00	8.50

Easy Spring Builders' Mortise Knob Locks.		
Two Springs to Latch. Wrought Iron Inside Work. Reverse by removing cap.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 2600, 3 1/2 in.	\$6.00	\$5.50
No. 2601, 3 1/2 in.	7.50	7.00
No. 2610, 4 in.	7.00	6.50
No. 2611, 4 in.	8.50	8.00

Easy Spring Builders' Mortise Knob Locks.		
Rack Tumbler, Wrought Iron Inside Work. 24 Changes. Two Springs to Latch. Reverse by simply pulling Latch Bolt forward and turning half round.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 2502, 3 1/2 in.	\$8.50	\$7.50
No. 2503, 3 1/2 in.	10.50	9.50
No. 2504, 3 1/2 in.	12.50	11.50
No. 2505, 3 1/2 in.	14.50	13.50
No. 2512, 4 in.	9.50	8.50
No. 2513, 4 in.	11.50	10.50
No. 2514, 4 in.	13.50	12.50
No. 2515, 4 in.	15.50	14.50
No. 2516, 4 1/2 in.	10.50	9.50
No. 2521, 4 1/2 in.	12.50	11.50
No. 2522, 4 1/2 in.	14.50	13.50
No. 2523, 4 1/2 in.	16.50	15.50

Easy Spring Builders' Mortise Knob Locks.		
Rack Tumbler, Wrought Iron Inside Work. 24 Changes. Two Springs to Latch. Reverse by removing cap.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 2602, 3 1/2 in.	\$8.00	\$7.00
No. 2603, 3 1/2 in.	10.00	9.00
No. 2604, 3 1/2 in.	11.00	10.00
No. 2605, 3 1/2 in.	12.00	11.00
No. 2612, 4 in.	9.00	8.00
No. 2613, 4 in.	10.00	9.00
No. 2614, 4 in.	11.00	10.00
No. 2615, 4 in.	12.00	11.00
No. 2616, 4 1/2 in.	13.00	12.00
No. 2621, 4 1/2 in.	14.00	13.00
No. 2622, 4 1/2 in.	15.00	14.00
No. 2623, 4 1/2 in.	16.00	15.00

Builders' Mortise Knob Locks.		
Wrought Iron Inside Work. Reverse by simply pulling Latch Bolt forward and turning half round. With 3 Rack Tumblers.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 071, 4 in.	\$18.50	\$17.50
No. 71, 4 1/2 in.	19.50	18.50

Villa Mortise Locks.		
Handed.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 82, 4 1/2 in.	\$16.00	\$15.00
No. 84, 4 1/2 in.	14.00	13.00
No. 85, 4 1/2 in.	16.00	15.00

Thin Mortise Knob Locks—Reverse by Turning Nut.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 180, 4 1/2 in.	\$10.50	\$9.50
No. 191, 4 1/2 in.	9.00	8.00

Thin Mortise Knob Locks—Reverse by Removing Cap.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 986, 4 1/2 in.	\$16.00	\$15.00
No. 987, 4 1/2 in.	14.00	13.00
No. 988, 4 1/2 in.	16.00	15.00
No. 989, 4 1/2 in.	10.00	9.00
No. 991, 4 1/2 in.	8.50	7.50

Rim Closes or Dead Locks.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 162 1/2, 3 in.	\$3.75	\$3.00
No. 170 1/2, 3 in.	5.00	4.25
No. 890, 3 in.	4.00	3.25
No. 153, 3 1/2 in.	5.50	4.75
No. 157, 3 1/2 in.	4.25	3.50
No. 159, 3 1/2 in.	6.00	5.25
No. 161, 3 1/2 in.	4.75	4.00
No. 154, 3 1/2 in.	4.50	3.75
No. 156, 3 1/2 in.	5.50	4.75
No. 158, 3 1/2 in.	4.50	3.75
No. 163, 4 in.	5.75	5.00
No. 171, 4 in.	4.00	3.25

Rim Latches.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 205, 3 1/2 in.	\$3.75	\$3.00
No. 207, 3 1/2 in.	5.00	4.00
No. 202, 4 in.	4.00	3.25
No. 204, 4 in.	5.00	4.25

Mortise Latch.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 0, 1 1/2 in.	\$2.00	\$1.50

Door Knobs.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 216, 2 1/2 in.	\$2.25	\$1.75
No. 218, 2 1/2 in.	2.25	1.75
No. 236, 2 1/2 in.	3.00	2.25
No. 238, 2 1/2 in.	3.00	2.25
No. 440, 2 1/2 in.	6.75	6.25
No. 442, 2 1/2 in.	7.25	6.75
No. 444, 2 1/2 in.	7.25	6.75
No. 446, 2 1/2 in.	7.25	6.75

Closet Knobs.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 252, 2 1/2 in.	\$2.25	\$1.75
No. 253, 2 1/2 in.	2.25	1.75
No. 254, 2 1/2 in.	3.00	2.25
No. 255, 2 1/2 in.	3.00	2.25
No. 256, 2 1/2 in.	6.75	6.25
No. 257, 2 1/2 in.	7.25	6.75
No. 258, 2 1/2 in.	7.25	6.75
No. 259, 2 1/2 in.	7.25	6.75

For Screen and Blind Doors.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 0218, 1 1/2 in.	\$2.25	\$1.75
No. 0238, 1 1/2 in.	3.00	2.25

Half Knobs.		
For Screen and Blind Doors.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 0233, 1 1/2 in.	2.25	1.75
No. 0236, 1 1/2 in.	3.00	2.25

Bronze Metal Door Knobs.		
2 1/2 in. with Round Rose.		
	Old Price.	New Price.
	Per Pair.	Per Pair.
No. 1137	\$2.50	\$2.25
No. 1139	2.50	2.25
No. 1141	2.50	2.25
No. 1143	2.50	2.25
No. 1145	2.50	2.25
No. 1147	2.50	2.25
No. 1149	2.50	2.25
No. 1151	2.50	2.25
No. 1153	2.50	2.25
No. 1155	2.50	2.25
No. 1157	2.50	2.25
No. 1159	2.50	2.25
No. 1161	2.50	2.25
No. 1163	2.50	2.25
No. 1165	2.50	2.25
No. 1167	2.50	2.25
No. 1169	2.50	2.25
No. 1171	2.50	2.25
No. 1173	2.50	2.25
No. 1175	2.50	2.25
No. 1177	2.50	2.25
No. 1179	2.50	2.25
No. 1181	2.50	2.25
No. 1183	2.50	2.25
No. 1185	2.50	2.25
No. 1187	2.50	2.25
No. 1189	2.50	2.25

2 1/2 in. with Elongated Rose.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 1131	\$2.75	\$2.50
No. 1133	2.75	2.50
No. 1135	2.75	2.50
No. 1137	2.75	2.50
No. 1139	2.75	2.50
No. 1141	2.75	2.50
No. 1143	2.75	2.50
No. 1145	2.75	2.50
No. 1147	2.75	2.50
No. 1149	2.75	2.50
No. 1151	2.75	2.50
No. 1153	2.75	2.50
No. 1155	2.75	2.50
No. 1157	2.75	2.50
No. 1159	2.75	2.50
No. 1161	2.75	2.50
No. 1163	2.75	2.50
No. 1165	2.75	2.50
No. 1167	2.75	2.50
No. 1169	2.75	2.50
No. 1171	2.75	2.50
No. 1173	2.75	2.50
No. 1175	2.75	2.50
No. 1177	2.75	2.50
No. 1179	2.75	2.50
No. 1181	2.75	2.50
No. 1183	2.75	2.50
No. 1185	2.75	2.50
No. 1187	2.75	2.50
No. 1189	2.75	2.50

2 1/2 in. with Elongated Rose.		
	Old Price.	New Price.
	Per doz.	Per doz.
No. 1153	\$3.25	\$3.00
No. 1155	3.25	3.00
No. 1157	3.25	3.00
No. 1159	3.25	3.00
No. 1161	3.25	3.00
No. 1163	3.25	3.00
No. 1165	3.25	3.00
No. 1167	3.25	3.00
No. 1169	3.25	3.00
No. 1171	3.25	3.00
No. 1173	3.25	3.00
No. 1175	3.25	3.00
No. 1177	3.25	3.00
No. 1179	3.25	3.00
No. 1181	3.25	3.00
No. 1183	3.25	3.00
No. 1185	3.25	3.00
No. 1187	3.25	3.00
No. 1189	3.25	3.00

BRITISH IRON MARKET.

(Specially reported by cable for The Iron Age.)
WEDNESDAY, July 5, 1876.

Scotch Pig.—The market is quiet, and but little business doing. Prices are steady and unchanged.

Manufactured Iron.—There is no demand whatever, and quotations are nominally £8. 10/4 for best Staffordshire Bars.

Rails.—There is a little better demand for Iron Rails, but prices are weak. Welsh are quoted £5. 5/ at £5. 15/.

IRON.

American Pig.—Owing to the holidays no transactions of any magnitude have been reported, and we quote as before: No. 1 Foundry, \$22 @ \$23; No. 2 Foundry, \$20 @ \$21; Gray Forge, \$20.

Scotch Pig.—The condition of the market is unchanged since our last review. We quote: Coltness, \$30; Glangarnock, \$28 @ \$29; Gartsherrie, \$29, and Eglinton, \$27.

Rails.—In the absence of transactions we continue our quotations of \$39 @ 42, at mill, for iron and steel, nominally, \$60 @ \$63, at tidewater.

Old Rails.—We quote \$21.50 @ \$22, without sales of any importance.

Scrap.—The market continues quiet and unchanged. We quote \$26 for Wrought, from yard.

METALS.

Copper.—Toward the close of last week a rather improved feeling began to manifest itself in the Copper market, interrupted since by the national festivities. The dealings were not large, but a slight recovery nevertheless took place, 200,000 lbs. Lake Superior changing hands at 19 1/2 c. @ 19 3/4 c., the latter bid at the close without sellers. No futures are to be had at prevailing rates. Baltimore continues scarce, and we quote the same nominally 19 1/2 c. @ 20 c.

In the London market, the decline which set in with the commencement of last month, has made further important headway, there having been a fresh drop of £2 in Best Selected, and £1. 10/ in Chili Bars, the former now being cabled £20, and the latter, £74. 10/. It is not easy to explain this rapid decline in Europe, unless we are to attach importance to the fact that the latest heavy orders for guns have been for steel field pieces, instead of cannon cast from phosphor bronze. Thus, the Italian government, in May sent a commission of artillery officers to Prussia for the immediate purchase of 400 cannon to be delivered in September. After due deliberation with the local artillery department the order was handed over to Mr. Krupp, at Essen, and the guns will be steel merely.

This would go to show that the latter metal in some leading quarters at least is again superseding the new alloy, whose sudden introduction gave such an impulse to the value of Copper, which is the main component of it. We would, however, remark that for machinery bearings and many other castings the new alloys of Copper are fast gaining ascendancy in Europe. The uses of Copper will, therefore, in any event be more extensive, even supposing that steel in the end prove more practical for field artillery. The manufactures of Copper are sustained. We quote: New Sheathing, 31 c.; Bolts and Braziers, 32 c.; Bronze and Yellow Metal Sheathing, 20 1/2 c. @ 21 c.; and Yellow Metal Bo ts, 26 c. @ 28 c., all cash.

Tin.—A sudden advance of £2 in English Tin was telegraphed to-day from London. Straits having recovered to £74. 10/ in the meantime. This improvement is in all likelihood due to the deliveries which have probably exceeded expectations, while the shipments from the East are notoriously light; the Netherlands Trading Society having at its late sale adopted the policy of meeting the market. The unsold quantity held by that corporation is henceforth quite manageable, and Continental consumers are therefore compelled to resort to the London with greater frequency. If, then, the quantities on the way from the Straits and Australia to London continue to be limited in amount during the present and ensuing month, there seems to be a reasonable prospect in view that at length the London stock will decrease a thousand tons or more, provided the general

deliveries remain steady. Under these circumstances we may be on the eve of steadily recovering values in the Tin markets, and the whole business may undergo a healthy transformation as we proceed toward the fall season. Our own market has not yet had sufficient leisure to disentangle itself from the paralyzation entailed by the holidays, but will, no doubt, be in a position to respond to the English advance if lasting. As heretofore we quote large lots in gold: Straits, 17 c. @ 17 1/2 c.; English Refined, 17 1/2 c. @ 18 c., nominally: English Common, 17 1/2 c. @ 17 3/4 c.; and Banca, 21 1/2 c. @ 22 c.

Tin Plates.—Any serious advance in Tin would fortify the position of the Tin Plate producers, and the latter article might then definitely touch bottom, should this circumstance coincide with a revival in the general demand for the fall trade. It is high time, indeed, that something favorable should occur in this branch, which has been an uninterrupted source of losses to all holders unable to rid themselves of their goods almost as fast as they got them. We are in great hopes that better times will soon dawn upon this important branch of the metal trade. The week has necessarily been a quiet one, and we repeat our quotations in gold, per box, ordinary brands, large lots: Charcoal Bright, \$6.75 @ \$7; do. Termes, \$6.37 1/2 @ \$6.50; Coke Tin, \$6; ditto Termes, \$5.50.

Lead.—There has been no change for the better in the Lead market. The number of larger consumers is more limited than a year or two ago, and even they do not by a great deal use as much Lead as they did at that time. A general revival in business is what Lead is waiting for as much as any other metal, and until that desideratum is at hand we cannot expect much activity, nor well sustained values. Speculation cannot do it. The government seems to have accepted 630 c., gold, for 100 tons last week; the sales since have amounted up about 75 tons in lots as 63 1/2 c., gold. We quote Common Domestic, 63 1/2 c. @ 63 3/4 c., gold. At St. Louis soft Missouri at last accounts stood 7 c., currency, and Common, ditto, 64 c. @ 64 1/2 c., currency. The receipts at St. Louis from Jan. 1st to June 24th were 283,422 pigs, against 236,367 in 1875. Foreign Lead we quote 6 1/2 c., gold, nominally for Common. The war in Europe has at length begun, and although for the present confined to Turkey and one of her vassal States, it is expected that Russia will soon take a hand in it, should Serbia be beaten. The remaining powers may then be induced to take sides, and the Lead market would soon feel the favorable effect of it. Till now Europe has continued to drop from a lack of trade demand. The manufactures of Lead are quiet, as follows: Bar, 8 1/2 c.; Pipe, 9 1/2 c.; and Sheet, 10 c., less 10 per cent. to the trade

country for the first five months of the following years were:

IMPORTS.			
	1874.	1875.	1876.
Copper in ores.....	3,816	3,498	3,741
" in regulus.....	4,725	7,750	6,340
Bars, cake and ingots.....	17,797	19,678	15,434
In pyrites, estimated.....	5,923	5,845	6,895
	31,261	35,665	31,810
EXPORTS.			
	1874.	1875.	1876.
English copper—wrought and unwrought.....	8,340	8,768	9,155
Foreign copper—unwrought.....	9,905	5,631	6,465
Yellow metal.....	5,834	5,603	5,111
	23,979	19,992	20,731

According to advices from Valparaiso the comparative exports of fine copper from Chili and Bolivia to all parts of the world during the first three months of the following years were:

	1876.	1875.	1874.	1873.	1872.	1871.	1870.
Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
13,488	12,324	12,289	8,563	12,163	10,171	14,370	

The relative proportions of the different descriptions of copper being:

	1876.	1875.	1874.	1873.
Bar copper.....	50.56 %	68.965 %	74.93 %	64.46 %
Copper regulus.....	16.90 %	24.065 %	18.05 %	27.72 %
Copper ore.....	2.84 %	7.970 %	6.72 %	7.82 %
100 %	100 %	100 %	100 %	
	1874.	1873.	1872.	1871.
Bar copper.....	70.27 %	60.676 %	56.96 %	
Copper regulus.....	27.70 %	34.289 %	40.86 %	
Copper ore.....	1.93 %	5.035 %	2.18 %	
100 %	100 %	100 %	100 %	

Tin.—Market quiet at \$74 for Straits and Australian, \$78 for British, and \$63 to \$65 for Peruvian.

Lead.—Market dull at \$21.50 to \$21.10 for ordinary shipping brands, and \$20.10 for Spanish without silver.

Spelter.—Market dull at \$23.50 to \$23.15 for ordinary Silesian Brands.

Stove Exhibits at the Centennial.

THOMAS, ROBERTS, STEVENSON & CO., Philadelphia, make a nice exhibit of stoves, prominent among which we may name the "Times," which was awarded the gold medal at the Louisiana State Fair, 1873. The manufacturers, in bringing out this stove, have exercised special care to produce an article that will meet the requirements of the public in all respects, and the large sales show how completely successful they have been in the undertaking. This stove is provided with improved double-acting flues, which gives it a very quick and powerful draft, while at the same time it is so closely fitted that the fire can be controlled with perfect ease. Its proportions are very symmetrical, and the adornments in good taste, while for convenience in its cooking arrangements it is all that can be desired. The "Harvest Home Cook" is another useful and neat looking stove, said to be an excellent baking stove, and particularly economical in its fuel requirements, and is suitable for coal or wood. The manufacturers say they mean to sell it as cheap as the inferior make of stoves, and give a guarantee of entire satisfaction. They also exhibit the "Commander Range," with six holes, the "Champion Range," with five holes, and the "Parlor Cabinet Range," and claim to have a combination of all the latest improvements in each of these ranges, with the addition of dust flue, operated by top damper, nickel-plated knobs, illuminating doors, broiler and feeder door, end shelf or plate warmer, etc., and, with water-backs to Nos. 7 and 8. Finally, we must mention the "Phoenix Portable Furnace," which has had a large sale, and we believe has given entire satisfaction wherever it has been introduced. Its peculiar construction gives it a large amount of radiating surface, the lower drum, consisting of outer shell of heavy wrought iron with heavy cast iron heads, containing nine to ten hot-air tubes. The cold air enters the bottom of these tubes, and passes out at the top hot, from thence to hot-air pipes. The upper or hot-air drum, into which the smoke passes after leaving the tubular drum, and carried entirely around it by a check before its exit to the smoke flue, is one of the most commendable features of this furnace, for which letters patent were granted February, 1874. All the cook stoves made by this firm are provided with the patent corrugated bar grate (patented April 25, 1876), making a more durable grate than the straight bar, as it resists contraction and expansion without bursting; is also more easily raked, and gives the stove a better draft.

CHAS. BURNHAM & CO., Nos. 117 and 119 South Tenth street, Philadelphia, make a display of gas stoves, which are attracting a good deal of attention, and which, we are informed, have been universally approved, after a fair trial. These stoves are of various sizes, and adapted for a variety of purposes. For heating purposes they have three sizes. They are very convenient for taking the chill from bedrooms and halls, as they require no chimney flue, and make no smoke, dust or ashes. For temporary heating purposes they are cheaper than any other fuel, as the gas can be shut off instantly when no longer required, and there is no trouble in providing fire or handling. The gas cooking stove, however, is the main attraction at this season, as it enables housekeepers to do their regular cooking, baking, &c., during the warm months at less expense than with coal or wood fuel, with less trouble, and, at the same time, keeping the house cool and comfortable. The manufacturers claim that the stoves will do any work reasonably to be expected of any ordinary cook stove; will heat iron, boil, roast, brew or fry, and, used with large oven, will be found an excellent baker. The firm also exhibits their nursery gas stoves, table gas stove, and a most useful little article called the gas *Ætina*, which is sold for fifty cents, and works perfectly over any ordinary gas burner. It is intended for nursery purposes, heating shaving water, making coffee, tea, gruel; will accommodate any size vessel from a small tin cup to a medium coffee-pot, burns with a blue flame, and does not smoke the brightest tinware. The exhibit is a very interesting one, and the claims put forth by the manufacturers are endorsed by many of our most prominent citizens, who have given their names as reference.

The Water Supply of New York.

The rapid extension of the area of certain great cities creates an important engineering difficulty, the dimensions of which grow as rapidly as the cities themselves. The difficulty lies in providing the inhabitants with a sufficient supply of pure water, and there are only two methods of dealing with it. One consists in introducing additional quantities of water as new streets are built, the other lies in inducing the inhabitants to place some moderate restriction on the use, or, more properly speaking, the abuse, of water. In Great Britain it becomes more difficult every day to obtain really good water in the enormous quantities required for such cities as London or Liverpool; and various expedients are adopted to compel economy in the use of the liquid. One consists in supplying water for only a limited period in the day. This is the system employed by the London water companies, but it is open to many and grave objections which we shall not stop here to explain. Another device consists in compelling householders and other users of water to adopt specially contrived fittings to prevent waste. A given quantity of water can be drawn at one time and no more until a reasonable interval has elapsed; and even if a tap were left open, no water could run to waste except a gallon or so. "Waste water preventors," as they are called, are now extensively used in London houses. Where the constant supply system is adopted, what is known as the "needle" ferrule has met with some favor. This ferrule is simply an expedient by which the service pipe to a house is so contracted in area that but a moderate quantity of water can pass; it is, and justly so, an extremely unpopular device. It is not necessary to say more here on these matters than will just suffice to refresh the memories of our readers concerning points of vital importance to the well-being of the population of towns and cities. In England, as we have stated, it has become so difficult to obtain large volumes of pure water at a moderate outlay that much attention is devoted to economizing water. For many years past we have pointed exultingly to the magnificent Croton aqueduct by which a torrent of water is poured daily into New York. Economy was a thing to which we gave no thought. New York, however, has not stood still, and a feeling of growing uneasiness has for some time found a home in the breasts of competent and intelligent American engineers. Fears have been expressed that the Croton aqueduct would not always suffice to supply the wants of New York, and that a time must come when very large sums would have to be expended in introducing a further supply. But there is always a period in the history of cities during which, although the inhabitants want more water, they do not want it enough to spend large sums in obtaining a further supply; and this epoch appears to be very nearly reached in New York. Not much has been said on the subject as yet, but the attention which has been given to such questions, when taken in connection with certain statements made from time to time in influential professional circles, all go to show that the Croton Aqueduct is no longer regarded as being all that New York can require as a means of water supply. The first definite authoritative note of warning was given by Mr. Benjamin S. Church in a paper on the Croton Water Works, read before the American Society of Engineers, last February. Mr. Church evidently speaks with a full knowledge of his subject; and although he disclaims all intention of underrating the qualities of the Croton aqueduct, the picture which he furnished of its present condition can hardly fail to excite apprehension. His statements go to show that the aqueduct can barely convey all the water that New York now requires; that it is almost totally inadequate to meet any increasing demand on its powers, and that it is in such a condition that incessant attention is requisite to avoid a catastrophe by which New York might be left almost entirely without water for a considerable period. As the Croton aqueduct has been looked upon as a model of its kind, Mr. Church has done good service in pointing out in what its defects lie, so that they may be avoided in future.

The Croton aqueduct has so often been described that we need say little concerning its general features here. It is a brick tunnel over 40 miles long, establishing a communication between a great reservoir at Croton and New York. The water supply is practically unlimited; but New York can nevertheless obtain no more than the aqueduct will convey. The gradient to which the latter is laid is extremely moderate, being only on an average a little less than 14 in. to the mile, with certain exceptions. Thus there is a length of 5 miles from Croton dam, in which the fall is but 7 in. to the mile, and from Manhattan Valley to the reservoir in Central Park—into which the aqueduct discharges—the fall is but 9 in. to the mile. Great lengths of the aqueduct are laid underground, but there are no fewer than 125 embankments from 180 ft. to 14,000 ft. in length, and from 10 ft. to 40 ft. high. The aggregate length of these embankments is about 5 miles. The aqueduct consists in cross section of two vertical side walls covered above with a true semi-circular arch, and united below by a segment of a much flatter arch. In making the embankment rubble stone foundations were first built without any mortar, about twice as wide as the tunnel. On the top of the rubble was laid a foot of hydraulic concrete, and on this the tunnel was built of masonry and lined with brick. Earth was then piled up at each side, and over the top of the rubble embankment and the tunnel, to keep out frost, and the slopes of the earth have been revetted with stones. It would appear that the walls of the culvert, or tunnel proper, are now, and always have been, too weak for the pressure within; but so long as no settlement occurred, no

leaks worth consideration opened. Unfortunately, in the embankments considerable settlements have taken place from time to time. It appears that these settlements continue to occur, and Mr. Church states that on all the embankments the aqueduct proper is split longitudinally top and bottom, and leaks have thus been originated. Some of these leaks become so alarming in severe weather that it becomes necessary to shut the water off at Croton, and to empty the entire aqueduct, in order that men may get inside to effect the necessary repairs. Now, a very great mistake was committed when the aqueduct was constructed. The builders imagined that they were building forever, and no provision was made for effecting repairs. It is true that manholes are provided at intervals, but no cross water gates were fitted, by the aid of which a section might be emptied, leaving the remainder of the aqueduct full; and thus it happens that whenever a leak occurs, be it near the upper or the lower end, the entire aqueduct must be emptied. This is necessitated from the fact that waste gate ponds, six or eight miles apart, are not provided with cross gates to enable the water to be stopped at that point and turned out. When such a serious leak occurs, as in the case of a certain embankment within a few miles of High Bridge, it requires 30 hours to rid the aqueduct of water in order to make repairs, and 15 hours more for the water to reach that point after being turned on at Croton, thus making a loss of 45 hours, exclusive of the time spent in making repairs, when three hours would suffice if cross gates were provided.

If the supply were more than sufficient, then this delay would be of little importance, but as in the summer especially the aqueduct can do little more than keep the Central Park reservoir full when working to its maximum capacity, it is clear that a total stoppage of supply for probably three or four days is a very serious matter. Mr. Church states that these repair stoppages may lower the water in the reservoir by as much as 10 ft., and that when this takes place the loss of pressure is sufficient to deprive upper stories of water over a considerable area of the city. Under present conditions, should an immediate succession of repairs become necessary, the reservoirs would be so reduced that the consequences might be disastrous. Lest it should be assumed that the imperfections of the aqueduct are exaggerated, Mr. Church states that, as it is impossible to cut off the supply for a sufficient period to enable substantial repairs—equivalent in places to reconstruction—to be effected, for some years past the constant supply has been maintained by the following expedients: So soon as a leak occurs, sawdust, fine sand and clay are mixed into a paste, and thrown in above the leak. This composition is carried into the fissures by the currents, when it swells and stops the leak for a time. When some change of temperature or other cause starts the leak again, the process is repeated. Increasing vigilance and care have been required on the part of the engineers and their employes to keep up the supply.

The failure of the aqueduct is attributable in some measure to the fact that it is overworked, the pressure within it being too great. Ultimately, a second aqueduct must be constructed, but at present almost the entire trouble could be avoided if the inhabitants of New York would only consent to regard water as a valuable commodity which must not be wasted. We suppose there is no city on the face of the earth in which so much water is wasted as in New York. The population is about 1,100,000, and the consumption is 114,000,000 of gallons per day, or 103 gallons per head. Probably the minimum allowance for any city is 20 gallons, and twice this should suffice for every conceivable contingency. London, with at least three times as many inhabitants as New York, has but 108,000,000 gallons per day, or about 30 gallons per head, and of this a considerable portion is wasted. The waste of water in New York is something enormous, and apparently proceeds night and day. Mr. Church suggests the use of meters, and the supply to every house of a reasonable quantity of water, say 40 gallons per head, without any but the ordinary charge, but for every gallon used beyond this standard number, he would exact a price so high that persons would take very good care that no waste would take place. The cost of meters he estimates at \$2,000,000; but he does not suggest any particular meter.

On this subject we have very decided ideas of our own. We believe that water meters should be required in all stores, public buildings, hotels, warehouses, ferry houses, wharves, manufactories, and wherever else the use of water is attended with advantage or profit. The great waste of water does not occur in dwellings. On the contrary, the housekeeper is, as the rule, a careful conservator of water, and until we have stopped the public waste of water we can afford to leave the householder alone. As a last recourse meters may be put into private houses, but were the waste in bar-rooms, hotels, wharves, warehouses and public buildings checked, our daily average consumption per head of population would probably be reduced nearly one-half.

It is probably unnecessary to comment on the statements we have placed before our readers. They are full of warning for every engineer who has to deal with the water supply of towns, and they prove that it is beyond all things essential, when expending considerable sums of money, to provide for a far greater demand than that of the moment. What work is constructed should be thoroughly sound and good, no matter what the cost; and care should be taken to so design mains, sluices and reservoirs that without much trouble the capacity for supply of the works can be largely augmented at a future period. The condition of the water supply of New York is, to say the least, extremely unsatisfactory. Either a new

aqueduct must be constructed, or some means must be adopted for preventing waste. We have in this case an example of what may occur when the supply of pure water is unlimited although distant. What would be the ultimate condition of New York if water was scarce as well as distant, it is difficult to imagine.

Glass from Blast Furnace Slag.

We have lately had an opportunity, says *Engineering*, of examining several specimens of glass manufactured under the patent of Mr. Bashley Britten. The process consists in using the slag from iron furnaces in its liquid state direct from the blast furnace. It is found that the whole of the slag when thus employed is convertible into perfectly transparent glass of a good color, and thus, by the utilization of a material now valueless, as well as of the heat it contains when thus taken direct from the furnace in its liquid state, so large a saving is effected that the process is likely to bring about most important changes in glass manufacture. The process has been successfully carried out at the iron works of Messrs. Chesland & Fisher, near Wellingborough, by Mr. Britten on behalf of a number of gentlemen interested in the patent.

The slag is conducted while in a liquid state into a tank holding about 15 cwt., where it is mixed with other materials, and in an incredibly short space of time, as compared with the ordinary method, glass is produced. This glass is acknowledged by the workmen to be of an exceedingly soft or plastic nature. It is perfectly acid proof and capable of use for all purposes for which the best bottle glass is suitable. It cuts readily with the diamond, and is available as rough plate for roofings, skylights, green houses, roofing tiles, and for many other uses from which glass, as heretofore manufactured, is, on account of its cost, necessarily shut out. Specimens have also been produced of this glass colored brilliantly, and suitable for the purposes for which colored glass is employed.

A private company has been formed and will shortly be registered with a capital of £200,000 for carrying out the manufacture of glass under this patent on an extensive scale.

Progress in Japan.—The rapidity with which the Japanese are assimilating the habits and science of the West is one of the greatest marvels of the age. Civilization until now has always taken the opposite course to that of the sun, and the change going on in these far eastern islands is not mere external imitation, but an absolute internal transformation. A few years ago an imperial college of engineering was established in the principal island, with the view of educating native engineers for the Department of Public Works. Admission is obtained by competitive examination, the course of instruction is very complete, and the college is at present under the management of English professors, the English language having apparently been adopted as the scientific tongue. In connection with this institution there are well-fitted laboratories and workshops of various kinds. The special courses are civil and mechanical engineering, telegraphy, architecture, practical chemistry and metallurgy. The number of students at the close of the last year was 273. We are also informed that energetic measures are being adapted by the government for introducing the improved manufacture of iron into the country. With this view, two charcoal blast furnaces and other works are in course of erection, and it is expected that, by the close of the present year, twelve puddling and seven reheating furnaces, forge train, plate, rail and bar guide mills, with steam hammers, four different shears, saws, lathes, cranes and all other necessary appliances of the most modern construction will be in operation.

Corrugated Iron.—Specimens of a new style of corrugated iron for building purposes have been submitted by an Austrian engineer named Pitze, to the Austrian Association of Architects and Engineers. The chief novelty in Pitze's patent is the shape of the corrugations; the walls of each being higher than their distance from each other, and having a vertical profile when the corrugated sheet is placed horizontally. This vertical position of the walls of each groove enables the corrugated sheet to bear its maximum load, and thus to fit it for general use in construction. It is being used for roofing in a new building in Vienna at the corner of the Lichtenauer-gasse.

Blown Cast Iron.—The *Moniteur des Interets Matériaux* says that considerable attention has been given of late, in Belgium, to a method for, to some degree, refining cast iron previous to puddling, put in practice by Mr. Fernand Hamoir, of Maubeuge. The process consists of submitting the cast iron, at the instant it is tapped from the blast furnace, to a current of air from the same blast that is being supplied to the tuyeres of the furnace itself; the process is very rapid, and the apparatus simple and inexpensive, while the advantage obtained is, that the pig iron is so far refined that one charge more per 24 hours can be worked in the puddling furnace.

Use of Rail Ends in Blast Furnaces.—According to Heyrowsky, it has been found, at Zeltweg, very advantageous to add the crop ends from the rail mill to the charge on the blast furnace, and at present, from this reason, the blast furnace at Zeltweg, which formerly only produced 250 tons of gray Bessemer pig iron per week, now turns out 270, the increase of the forty tons in the make corresponding exactly to the quantity of rail ends added to the charge.

Thin Iron.—Some exceedingly thin iron sheets have just been rolled at the works of the Pearson & Knowles Coal and Iron Company, at Warrington. They are stated to be no more than 0.0015 in. thick, and the specimens forwarded to the *Mining Journal* office is about 3 inches by 1½ inches, and has but four very small holes in it. The peculiarity is that Mr. Hooper, the energetic manager of the works, rolls the sheets from iron produced from the pig to the rolled sheets, at the Company's Dallam and Bewsey forges, by a process devised by himself, and which permits of the sheets being rolled several at once, and without sticking. The iron must be of excellent quality to permit of such thin sheets being rolled at all.

A curious little engine, termed an electro-capillary motor, has been described by M. Lippmann. If a globule of mercury be placed in a saucer, together with a little solution of potassium dichromate, acidified with sulphuric acid, and it be touched upon the side with a point of iron, it will at once contract laterally, drawing itself away from the iron. This will break the contact; gravity will spread the globule out again, when it will again touch the iron and contract; and so on. The explanation of this phenomenon is to be found in the fact that the electric current developed on contact of the two metals, changes the capillary constant of the mercury, and hence its form. This is the action which M. Lippmann has utilized in his motor. In a glass tank filled with diluted sulphuric acid, are two small cylinders containing mercury. A bundle of capillary tubes, open at both ends, is placed in each cylinder, resting on the mercury, each bundle being connected above with one end of a walking beam, to the prolongation of which is attached a connecting rod, crank and fly-wheel. By means of a commutator on the axis of the fly-wheel, the mercury in each cylinder is alternately connected with a small battery; its capillary constant is changed, its ascent in the tubes increased, that side preponderates, and causes semi-rotation of the fly-wheel. This sends the current to the other cylinder, which, acting similarly, completes the rotation. As many as 100 revolutions per minute have been obtained with this engine. Conversely, on rotating the fly-wheel by hand, a galvanometer in the current indicates the production of an electric current.

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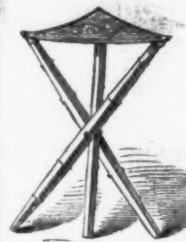
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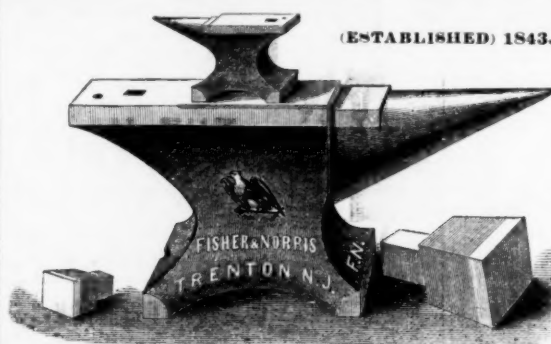
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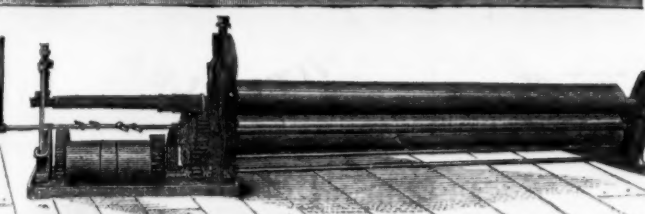
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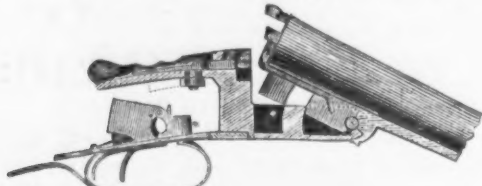
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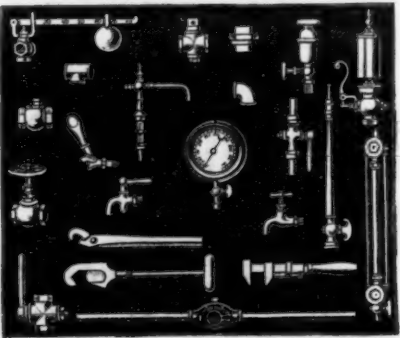
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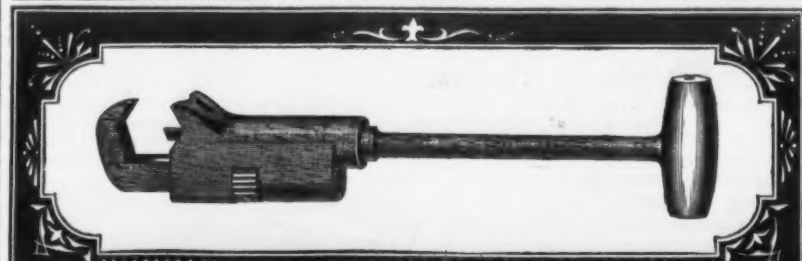
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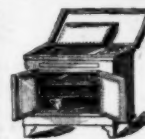
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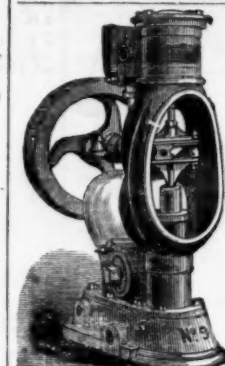
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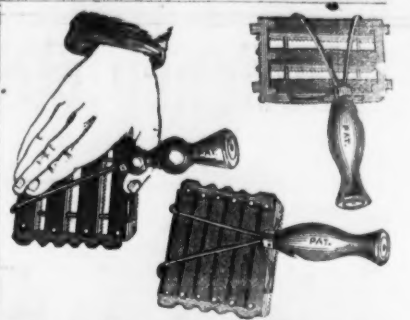
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while using the comb. The wire braces which run from
the shank over the back to the front teeth give strength
and durability in a direction never heretofore attained,
and at the same time serve as an extra handle; and
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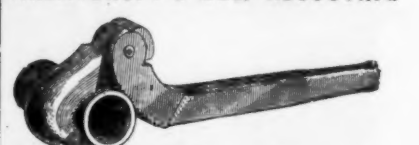
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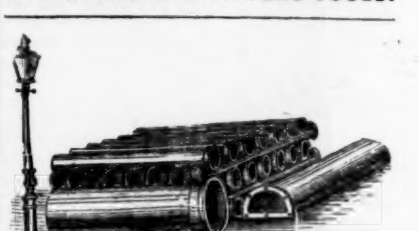
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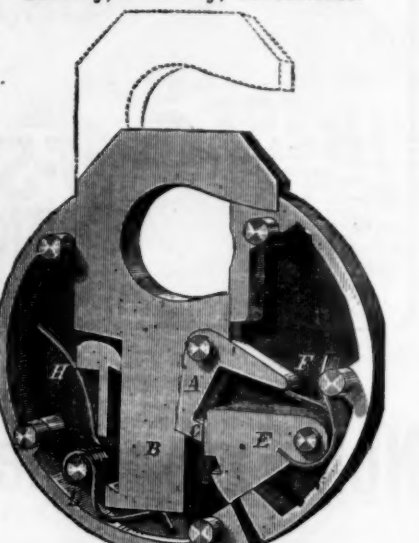
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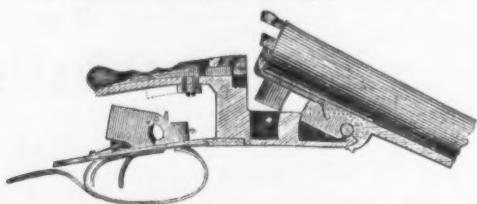
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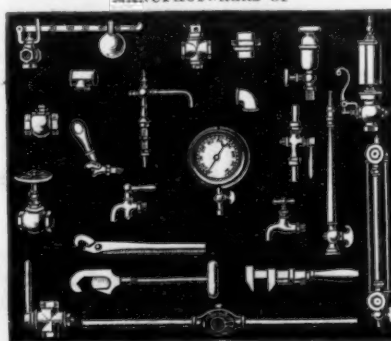
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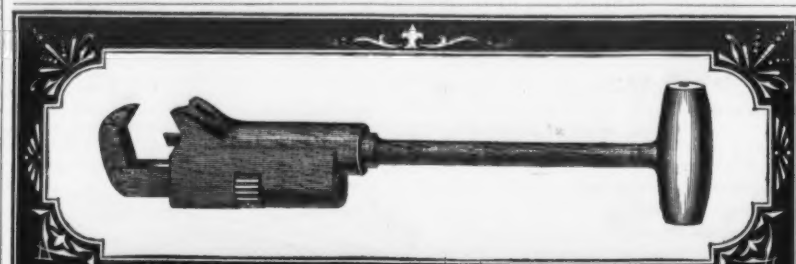
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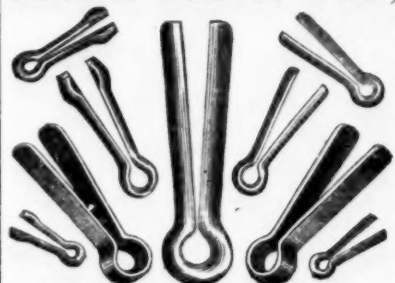
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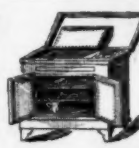
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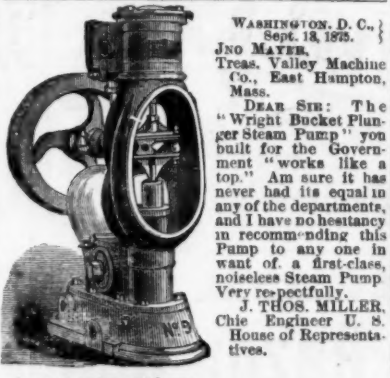
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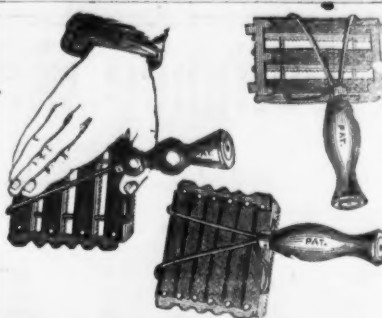
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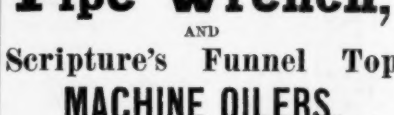
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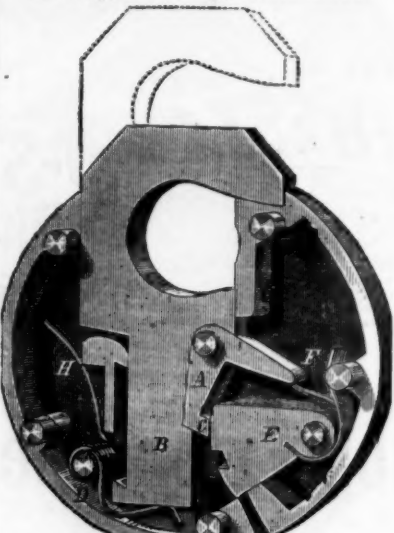
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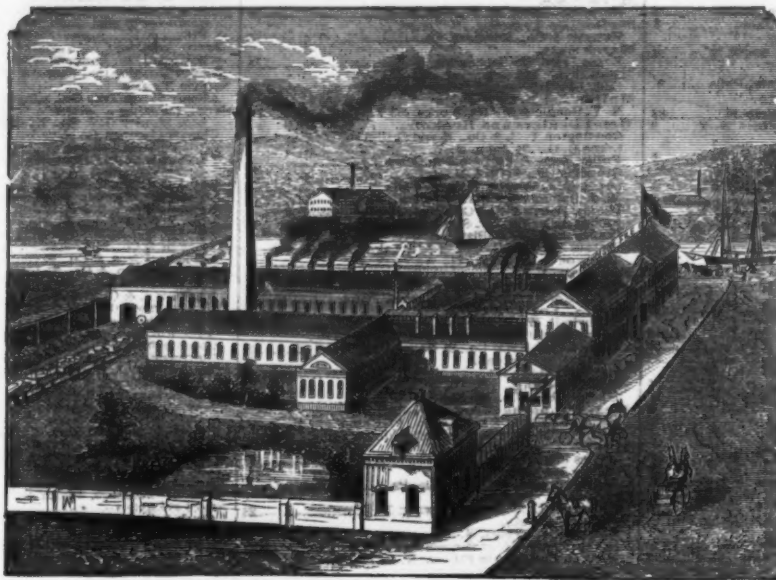
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PRINCIPAL OFFICES, PHILADELPHIA.

COX & COX,

Counsellors at Law,

229 Broadway, NEW YORK.

Practice in cases relating to

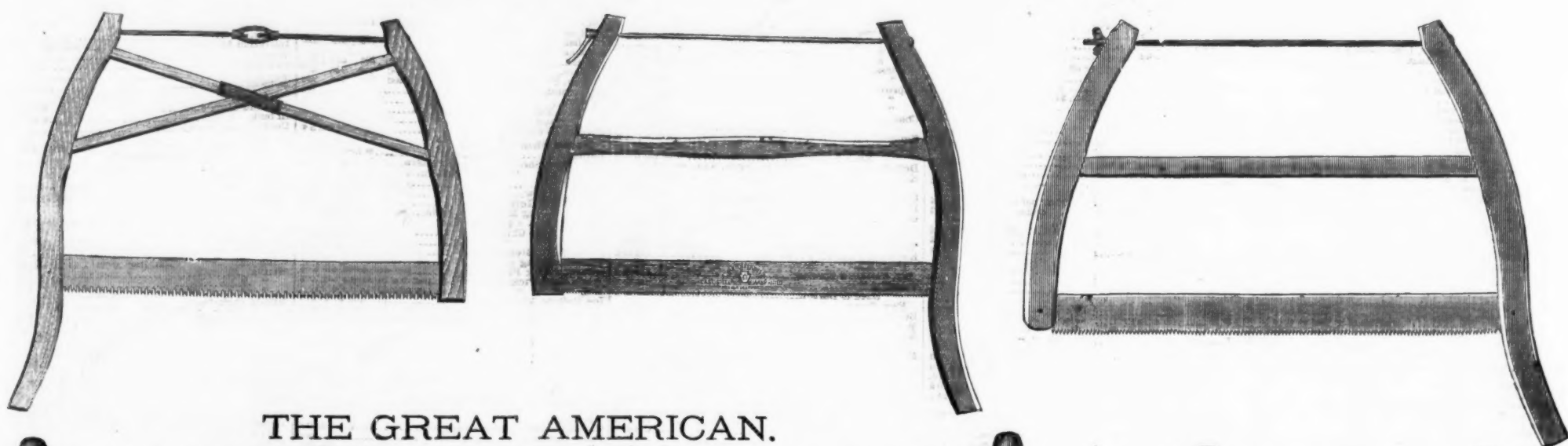
PATENTS and

</

Keystone Saw, Tool, Steel and File Works.

Front and Laurel Streets, Philadelphia.

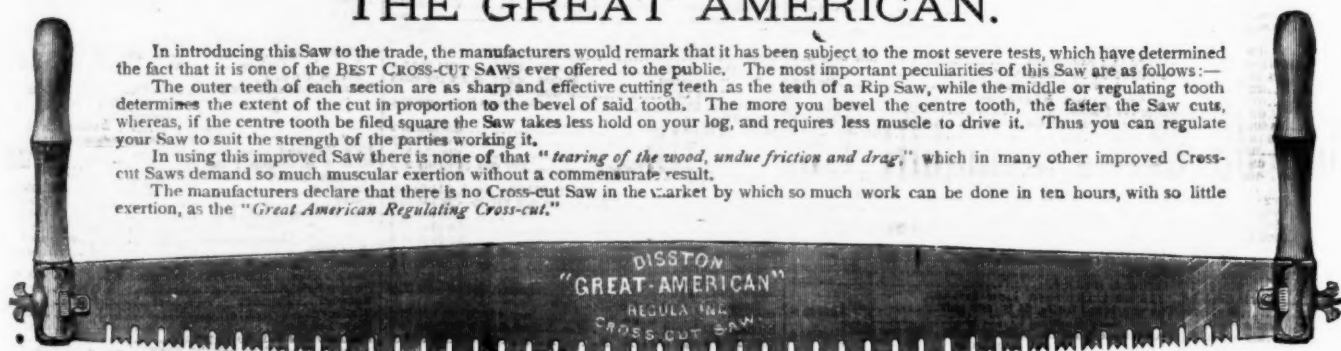
HENRY DISSTON & SONS, IMPROVED CROSS-CUT AND WOOD SAWS.



THE GREAT AMERICAN.

In introducing this Saw to the trade, the manufacturers would remark that it has been subject to the most severe tests, which have determined the fact that it is one of the BEST CROSS-CUT SAWS ever offered to the public. The most important peculiarities of this Saw are as follows:—
The outer teeth of each section are as sharp and effective cutting teeth as the teeth of a Rip Saw, while the middle or regulating tooth determines the extent of the cut in proportion to the bevel of said tooth. The more you bevel the centre tooth, the faster the Saw cuts, whereas, if the centre tooth be filed square the Saw takes less hold on your log, and requires less muscle to drive it. Thus you can regulate your Saw to suit the strength of the parties working it.

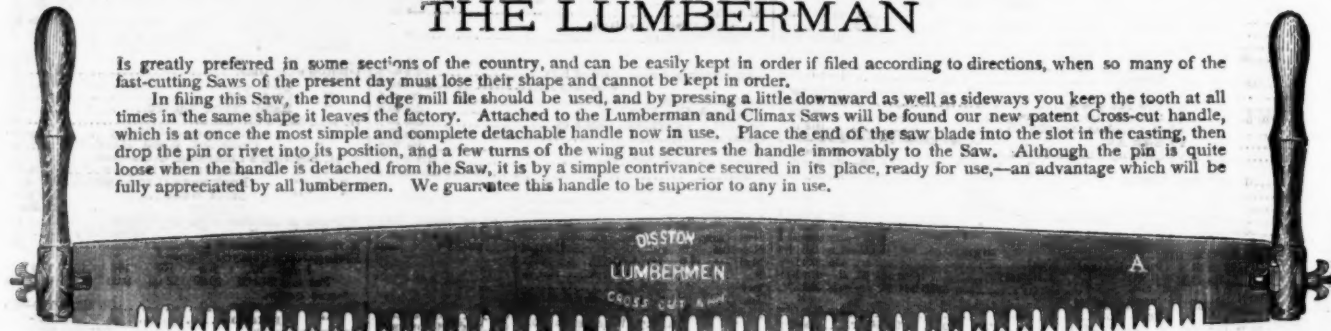
In using this improved Saw there is none of that "tearing of the wood, undue friction and drag," which in many other improved Cross-cut Saws demand so much muscular exertion without a commensurate result.
The manufacturers declare that there is no Cross-cut Saw in the market by which so much work can be done in ten hours, with so little exertion, as the "Great American Regulating Cross-cut."



THE LUMBERMAN

Is greatly preferred in some sections of the country, and can be easily kept in order if filed according to directions, when so many of the fast-cutting Saws of the present day must lose their shape and cannot be kept in order.

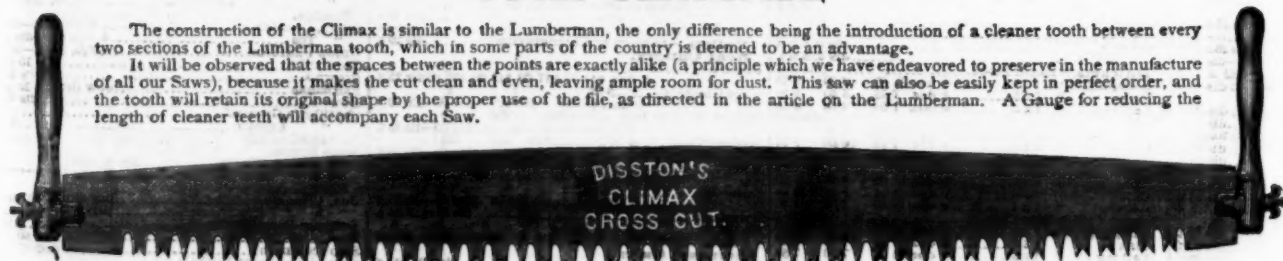
In filing this Saw, the round edge mill file should be used, and by pressing a little downward as well as sideways you keep the tooth at all times in the same shape it leaves the factory. Attached to the Lumberman and Climax Saws will be found our new patent Cross-cut handle, which is at once the most simple and complete detachable handle now in use. Place the end of the saw blade into the slot in the casting, then drop the pin or rivet into its position, and a few turns of the wing nut secures the handle immovably to the Saw. Although the pin is quite loose when the handle is detached from the Saw, it is by a simple contrivance secured in its place, ready for use,—an advantage which will be fully appreciated by all lumbermen. We guarantee this handle to be superior to any in use.



THE CLIMAX.

The construction of the Climax is similar to the Lumberman, the only difference being the introduction of a cleaner tooth between every two sections of the Lumberman tooth, which in some parts of the country is deemed to be an advantage.

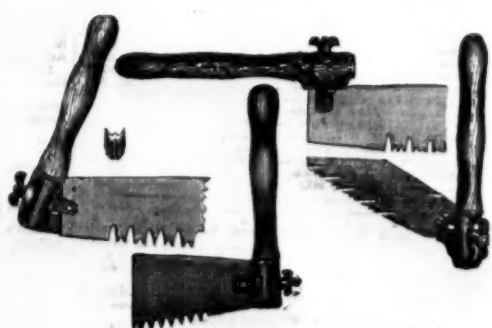
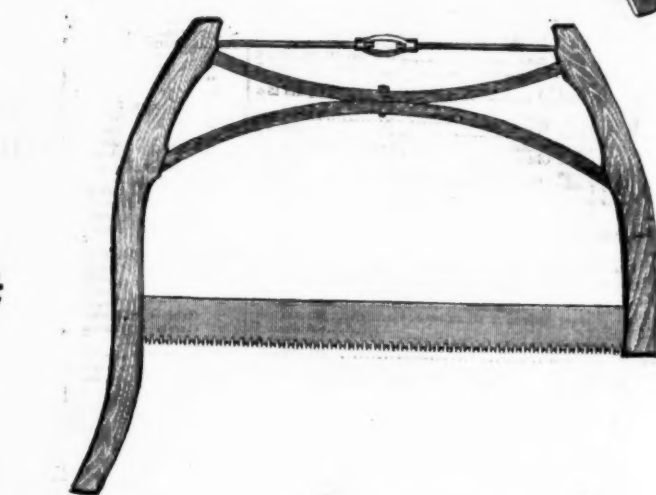
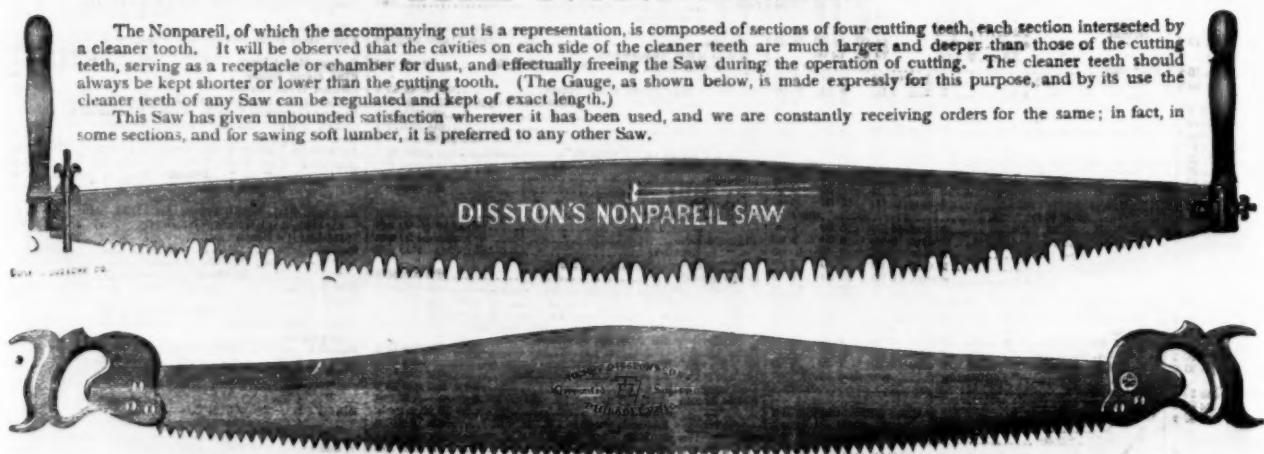
It will be observed that the spaces between the points are exactly alike (a principle which we have endeavored to preserve in the manufacture of all our Saws), because it makes the cut clean and even, leaving ample room for dust. This saw can also be easily kept in perfect order, and the tooth will retain its original shape by the proper use of the file, as directed in the article on the Lumberman. A Gauge for reducing the length of cleaner teeth will accompany each Saw.



THE NONPAREIL.

The Nonpareil, of which the accompanying cut is a representation, is composed of sections of four cutting teeth, each section intersected by a cleaner tooth. It will be observed that the cavities on each side of the cleaner teeth are much larger and deeper than those of the cutting teeth, serving as a receptacle or chamber for dust, and effectually freeing the Saw during the operation of cutting. The cleaner teeth should always be kept shorter or lower than the cutting tooth. (The Gauge, as shown below, is made expressly for this purpose, and by its use the cleaner teeth of any Saw can be regulated and kept of exact length.)

This Saw has given unbounded satisfaction wherever it has been used, and we are constantly receiving orders for the same; in fact, in some sections, and for sawing soft lumber, it is preferred to any other Saw.



New York Wholesale Prices, July 5, 1876.

HARDWARE.

[illegible]

Loose Joint, Narrow and Broad.....doz 50 10
Parliament, Butts & Mayer's Hinges.....doz 4 3x3
Loose Pin.....doz 4 3x4
Loose Pin, narrow.....doz 4 3x5
Loose Pin Jap d, Drilled and Wired.....doz 30 10
Fast Joint, Narrow.....doz 25 10
" " Broad.....doz 35 10
Fast Joints, Broad, Japanese.....doz 30 10
Loose Joint.....doz 30 10
Parliament & Mayer's Hinges.....doz 4 3x4
Loose Pin, narrow.....doz 4 3x5
" " Acorn.....doz 4 3x1
" " Japanese.....doz 4 3x10
" " Rated Time.....doz 4 3x10
Union Mfg. Co.'s Fancy Butts.....doz 5 10
Figured Enamelled Loose Joint.....doz 5 10
Nicer Plated.....doz 5 10
Lyttle Steel, Plain.....doz 3 3x3
Boston Flat, " " with Iron Acorns.....doz 3 3x3
" " " " with Sil'.....doz 3 3x3
Fast Joint, Narrow.....doz 25 10
" " Lt. Narrow.....doz 25 10
Eureka.....doz 25 10
Loose Joint, Broad.....doz 30 10
Table Butts, Back Flans, &c.....doz 3 3x3
Lyttle Steel, Acorn.....doz 3 3x3
And Spr. Spring Butz Co., Hart May 18.....doz 3 3x3
Union Sprng Hinge.....doz 3 3x3
Blind Butts, Parker.....doz 3 3x3
" " Seymour.....doz 3 3x3
" " Shepard.....doz 3 3x3
" " Nicholson.....doz 3 3x3
" " Hunter.....doz 3 3x3
" " Warrington, No. 1.....doz 3 3x3
" " Clark's, Nos. 1, 3 and 5.....doz 3 3x3
" " Clark's No. 2.....doz 3 3x3
" " Nos. 2, 4, 4 1/2, 5, 5 1/2
Can Openers.....per doz \$2 10 30
Messenger's Comet.....per doz \$2 10 30
American.....per doz \$2 10 30
No. 4 French.....per doz \$2 10 30
No. 5, Iron Handle.....per doz \$2 10 30
Springs.....per doz \$4 00 4 30 5 00 9 10 15 25 30
Star.....per doz \$5 10 15 25 30
Sardine Slicer.....per doz \$7 00 15 40
G. I.....per doz \$7 00 15 40
Cups-Perussation, per 100.....doz 8 75
D. I.....doz 8 75
Double Waperoof, 1-4, \$1.50; 1-10, \$1.25; 1-20, \$1.00; 1-30, \$1.00; 1-40, \$1.00; 1-50, \$1.00; 1-60, \$1.00; 1-70, \$1.00; 1-80, \$1.00; 1-90, \$1.00; 1-100, \$1.00; 1-110, \$1.00; 1-120, \$1.00; 1-130, \$1.00; 1-140, \$1.00; 1-150, \$1.00; 1-160, \$1.00; 1-170, \$1.00; 1-180, \$1.00; 1-190, \$1.00; 1-200, \$1.00; 1-210, \$1.00; 1-220, \$1.00; 1-230, \$1.00; 1-240, \$1.00; 1-250, \$1.00; 1-260, \$1.00; 1-270, \$1.00; 1-280, \$1.00; 1-290, \$1.00; 1-300, \$1.00; 1-310, \$1.00; 1-320, \$1.00; 1-330, \$1.00; 1-340, \$1.00; 1-350, \$1.00; 1-360, \$1.00; 1-370, \$1.00; 1-380, \$1.00; 1-390, \$1.00; 1-400, \$1.00; 1-410, \$1.00; 1-420, \$1.00; 1-430, \$1.00; 1-440, \$1.00; 1-450, \$1.00; 1-460, \$1.00; 1-470, \$1.00; 1-480, \$1.00; 1-490, \$1.00; 1-500, \$1.00; 1-510, \$1.00; 1-520, \$1.00; 1-530, \$1.00; 1-540, \$1.00; 1-550, \$1.00; 1-560, \$1.00; 1-570, \$1.00; 1-580, \$1.00; 1-590, \$1.00; 1-600, \$1.00; 1-610, \$1.00; 1-620, \$1.00; 1-630, \$1.00; 1-640, \$1.00; 1-650, \$1.00; 1-660, \$1.00; 1-670, \$1.00; 1-680, \$1.00; 1-690, \$1.00; 1-700, \$1.00; 1-710, \$1.00; 1-720, \$1.00; 1-730, \$1.00; 1-740, \$1.00; 1-750, \$1.00; 1-760, \$1.00; 1-770, \$1.00; 1-780, \$1.00; 1-790, \$1.00; 1-800, \$1.00; 1-810, \$1.00; 1-820, \$1.00; 1-830, \$1.00; 1-840, \$1.00; 1-850, \$1.00; 1-860, \$1.00; 1-870, \$1.00; 1-880, \$1.00; 1-890, \$1.00; 1-900, \$1.00; 1-910, \$1.00; 1-920, \$1.00; 1-930, \$1.00; 1-940, \$1.00; 1-950, \$1.00; 1-960, \$1.00; 1-970, \$1.00; 1-980, \$1.00; 1-990, \$1.00; 1-1000, \$1.00; 1-1010, \$1.00; 1-1020, \$1.00; 1-1030, \$1.00; 1-1040, \$1.00; 1-1050, \$1.00; 1-1060, \$1.00; 1-1070, \$1.00; 1-1080, \$1.00; 1-1090, \$1.00; 1-1100, \$1.00; 1-1110, \$1.00; 1-1120, \$1.00; 1-1130, \$1.00; 1-1140, \$1.00; 1-1150, \$1.00; 1-1160, \$1.00; 1-1170, \$1.00; 1-1180, \$1.00; 1-1190, \$1.00; 1-1200, \$1.00; 1-1210, \$1.00; 1-1220, \$1.00; 1-1230, \$1.00; 1-1240, \$1.00; 1-1250, \$1.00; 1-1260, \$1.00; 1-1270, \$1.00; 1-1280, \$1.00; 1-1290, \$1.00; 1-1300, \$1.00; 1-1310, \$1.00; 1-1320, \$1.00; 1-1330, \$1.00; 1-1340, \$1.00; 1-1350, \$1.00; 1-1360, \$1.00; 1-1370, \$1.00; 1-1380, \$1.00; 1-1390, \$1.00; 1-1400, \$1.00; 1-1410, \$1.00; 1-1420, \$1.00; 1-1430, \$1.00; 1-1440, \$1.00; 1-1450, \$1.00; 1-1460, \$1.00; 1-1470, \$1.00; 1-1480, \$1.00; 1-1490, \$1.00; 1-1500, \$1.00; 1-1510, \$1.00; 1-1520, \$1.00; 1-1530, \$1.00; 1-1540, \$1.00; 1-1550, \$1.00; 1-1560, \$1.00; 1-1570, \$1.00; 1-1580, \$1.00; 1-1590, \$1.00; 1-1600, \$1.00; 1-1610, \$1.00; 1-1620, \$1.00; 1-1630, \$1.00; 1-1640, \$1.00; 1-1650, \$1.00; 1-1660, \$1.00; 1-1670, \$1.00; 1-1680, \$1.00; 1-1690, \$1.00; 1-1700, \$1.00; 1-1710, \$1.00; 1-1720, \$1.00; 1-1730, \$1.00; 1-1740, \$1.00; 1-1750, \$1.00; 1-1760, \$1.00; 1-1770, \$1.00; 1-1780, \$1.00; 1-1790, \$1.00; 1-1800, \$1.00; 1-1810, \$1.00; 1-1820, \$1.00; 1-1830, \$1.00; 1-1840, \$1.00; 1-1850, \$1.00; 1-1860, \$1.00; 1-1870, \$1.00; 1-1880, \$1.00; 1-1890, \$1.00; 1-1900, \$1.00; 1-1910, \$1.00; 1-1920, \$1.00; 1-1930, \$1.00; 1-1940, \$1.00; 1-1950, \$1.00; 1-1960, \$1.00; 1-1970, \$1.00; 1-1980, \$1.00; 1-1990, \$1.00; 1-2000, \$1.00; 1-2010, \$1.00; 1-2020, \$1.00; 1-2030, \$1.00; 1-2040, \$1.00; 1-2050, \$1.00; 1-2060, \$1.00; 1-2070, \$1.00; 1-2080, \$1.00; 1-2090, \$1.00; 1-2100, \$1.00; 1-2110, \$1.00; 1-2120, \$1.00; 1-2130, \$1.00; 1-2140, \$1.00; 1-2150, \$1.00; 1-2160, \$1.00; 1-2170, \$1.00; 1-2180, \$1.00; 1-2190, \$1.00; 1-2200, \$1.00; 1-2210, \$1.00; 1-2220, \$1.00; 1-2230, \$1.00; 1-2240, \$1.00; 1-2250, \$1.00; 1-2260, \$1.00; 1-2270, \$1.00; 1-2280, \$1.00; 1-2290, \$1.00; 1-2300, \$1.00; 1-2310, \$1.00; 1-2320, \$1.00; 1-2330, \$1.00; 1-2340, \$1.00; 1-2350, \$1.00; 1-2360, \$1.00; 1-2370, \$1.00;

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Gum, Copal. 30
" Damar. 25
" Shellac, English. 30
Litharge. 30
Pumice Stone, selected Lump. 40
Putty in bladders. 16
" in tulk. 30
Rotton Stone, soft, English. 30
Spirits Turpentine. 30
Whitish, Spanish. 30

Glass.
FRENCH WINDOW GLASS.
Prices current per box of 20 feet.

Single Thick.				
SIZES.	1st.	2d.	3d.	4th.
6 x 8 to 10 x 15.....	\$ 7-50	\$ 6-75	\$ 6-25	\$ 5-75
11 x 14 to 16 x 24.....	8-50	7-75	7-25	6-75
18 x 24 to 30 x 30.....	10-75	9-75	8-75	7-75
15 x 30 to 24 x 36.....	12-25	10-75	9-00	8-00
26 x 28 to 24 x 26.....	13-00	11-50	9-75	8-75
26 x 36 to 26 x 44.....	14-50	13-25	10-75	9-75
26 x 46 to 30 x 50.....	15-00	14-00	11-25	10-25
30 x 54 to 30 x 54.....	16-00	14-50	12-00	11-00
30 x 54 to 34 x 6.....	17-25	15-50	13-00	12-00
34 x 58 to 34 x 60.....	18-25	17-25	15-00	14-00
36 x 58 to 40 x 60.....	30-75	18-75	17-25	16-25

Double Thick.				
SIZES.	1st.	2d.	3d.	4th.
6 x 8 to 10 x 15.....	\$12-00	\$11-00	\$10-00	\$ 9-25
11 x 14 to 16 x 24.....	13-75	12-50	11-75	10-25
18 x 24 to 30 x 30.....	17-25	15-75	14-00	12-50
15 x 30 to 24 x 36.....	19-75	17-25	15-50	14-00
26 x 28 to 24 x 36.....	21-00	18-50	16-75	15-25
26 x 36 to 26 x 44.....	23-25	21-25	18-75	17-25
26 x 46 to 30 x 50.....	24-00	22-50	19-00	18-00
30 x 54 to 30 x 54.....	25-75	23-50	20-25	19-25
30 x 54 to 34 x 6.....	27-75	25-00	21-75	20-75
34 x 58 to 34 x 60.....	29-25	27-75	24-00	23-00
36 x 60 to 40 x 60.....	32-25	30-00	27-75	26-75

Sizes above 40 x 60—(100) per box extra for every five inches.
 An additional 10 per cent. will be charged for all Glass more than 40 inches wide. All sizes above 52 inches in length, and not making more than 81 united inches, will be charged in the 84 united inches bracket.
 Discount 50&10 @ 50&15%.

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Merchants, Buffalo, N. Y.
The Superior Brand,
RED HORSE NAILS.
 Improved machinery and actually hammered from the very



8 9 10

E. CO., New York Agents,

Way Valve Co.



E & CO., Agents,
83 Reade St., N. Y.

"IMPROVED
Freezer.
 Not the CHEAPEST, but
 the BEST.
 FOUR STYLES—FOURTEEN SIZES.
GEARED FREEZERS.

No. 10.....	2 quart.
No. 20.....	3 "
No. 21.....	4 "
No. 22.....	5 "
No. 23.....	6 "
No. 24.....	8 "
No. 25.....	12 "
No. 30.....	16 "
No. 35.....	30 "

WHEEL FREEZERS.

No. 36.....	16 quart.
No. 37.....	20 "

FREEZERS.

No. 38.....	32 quart.
No. 39.....	40 "

DUPLEX FREEZERS.

No. 39.....	Two 20 quarts
-------------	---------------

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& CO., Buffalo, N. Y.

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SULZBACHER, HYMAN, WOLFF & CO.,

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IRON AND STEEL.

Sole Agents for the Sale of the Celebrated

Pr. HOMOGENOUS DEC.' CAST STEEL, GUN BARRELS, MOULDS AND ORDNANCE.Sole Agents for **COCKER BROTHERS, Limited.**

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Cast Steel Hammers and Sledges. Also, "M. & G." Anvils and Vises.

WARRANTED CAST STEEL, especially adapted for DIES and TURN-
PUNCHES and all kinds of MACHINISTS' TOOLS.
Celebrated Improved Mild Centre Cast Steel, for Taps, Reamers, and Milling Tools,
warranted not to crack in hardening Taps of any size.
Swede Spring Steel, especially adapted to Locomotive and Railway Car Springs.
English Spring and Plow Plate Steel.

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in Material & Workmanship.W. H. E. & CO. have pleasure in announcing the
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of Crucible Cast Steel, Files, Steel Wire, Tools, &c.
This is the ONLY Award to any Exhibitor of
STEEL WIRE in the British Section.**STEEL,
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Warehouse, 82 John St., New York.

established 1816.

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ALSO STEEL of superior quality for Turning Tools, Taps, Dies, Drills, &c.
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STEEL,**In Bars, Sheets and Coils, for fine Pen and Pocket Cutlery, Table, Carving,
Butcher and Shoe Knives, Turning Tools, Dies, Files, Clock or other Springs,
Saws and Tools of every variety.**SHEFFIELD, ENGLAND.**

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them of our ability to supply an article that cannot be equalled in
quality, temper, and adaptation in all respects to the various purposes
for which it may be required. Half a century of practical experience
in all departments of Steel manufacture, a long established
reputation in England, and the Continent of Europe, and in the United
States principally of this Country, encourage us to solicit a universal
trial of our Steel for the above or other purposes for which a first
class material, in quality, temper, and durability is needed.*

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All descriptions of Cast and German

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Elliptic and Side Springs, Seat Springs,

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Have maintained their great reputation for 75
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THE MOST POPULAR POWDER IN USE.

Also, SPORTING, MINING, SHIPPING, AND BLAST-
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For sale in all parts of the country. Represent-
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Invite the attention of the Hardware Trade to their
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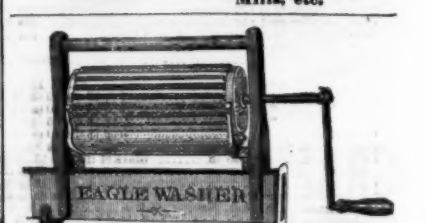
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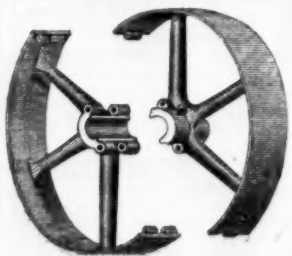
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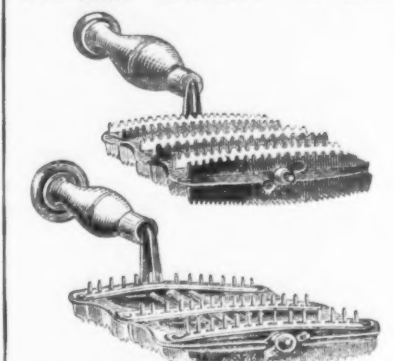


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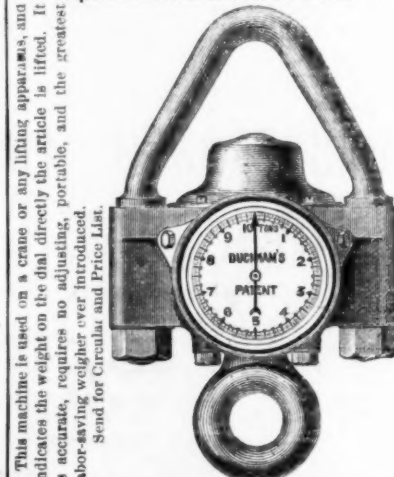
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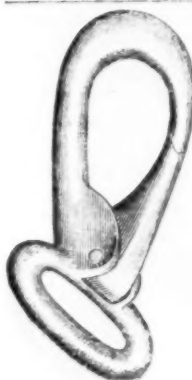
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Which cannot be forced back
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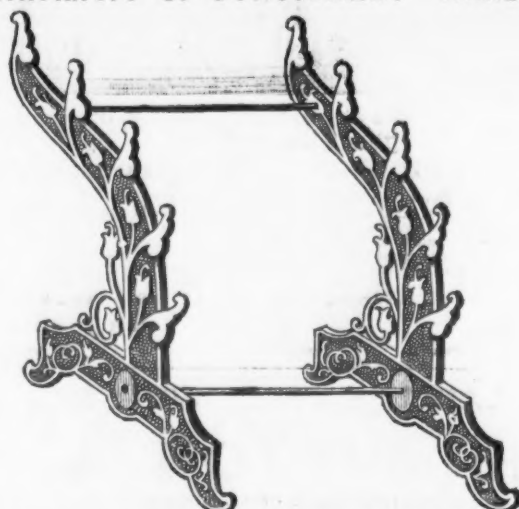
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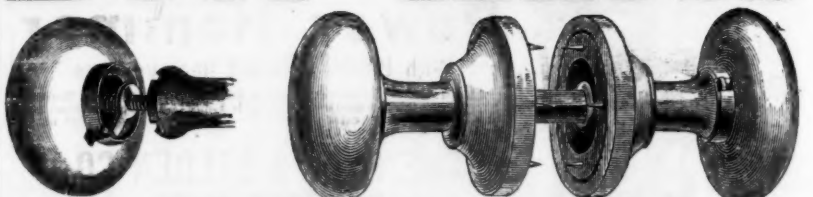
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WITHOUT THE USE OF RINGS.

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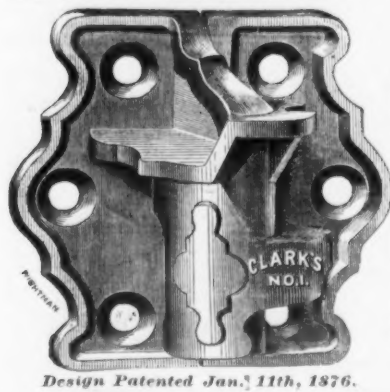
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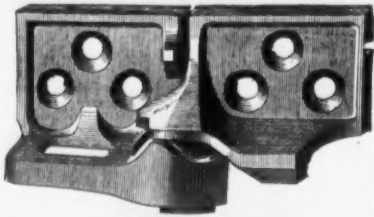
Warehouse, 97 Chambers and 81 Reade Streets, N. Y.



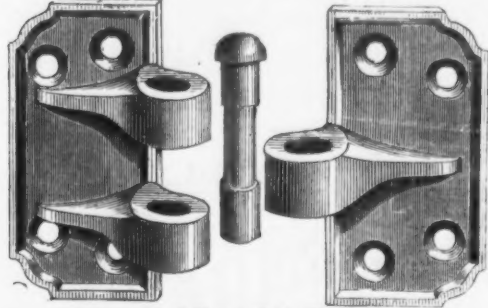
CLARK & CO., BUILDERS' HARDWARE. BUFFALO, N. Y.



Design Patented Jan. 11th, 1876.

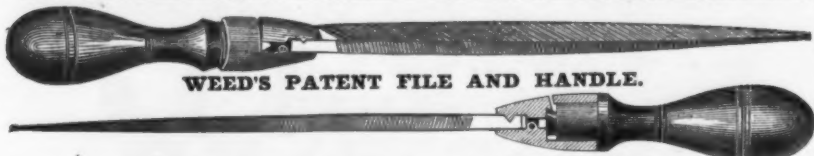


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No. 1 Upper Gate Hinge.

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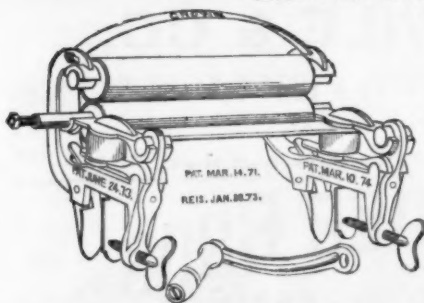
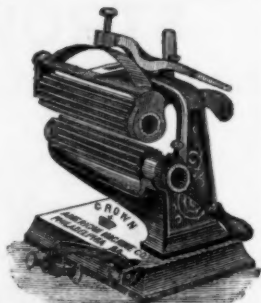
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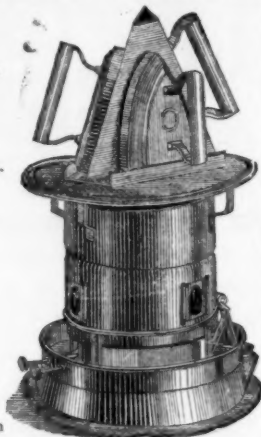
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Suitable for all purposes, for Cooking, Baking and Ironing.
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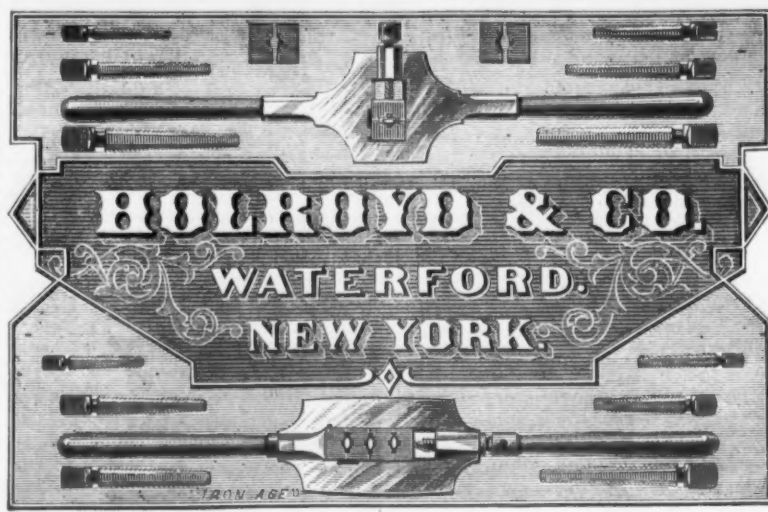
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Manufacturers of Latest Improved Machine Tools, Rotary Shapers, two sizes, Iron Planers, all sizes, Horizontal Drill Attachments, for upright power drills, Self-feeding Portable Drills, hand or power, Expansion Boring Bars, five sizes, Universal Slide Rest, for taper work, Twist Drill Sharpening Machines, automatic and adjustable in every direction, Noiseless Friction Gears, for transmitting up to thirty horse-power. Send for Descriptive Circulars.

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We use five machines most of the time, storing 10 tons in 10 hours with each machine and one man, at a cost of three cents per ton. When using three machines the cost is 1 1/2 cents per gross ton.

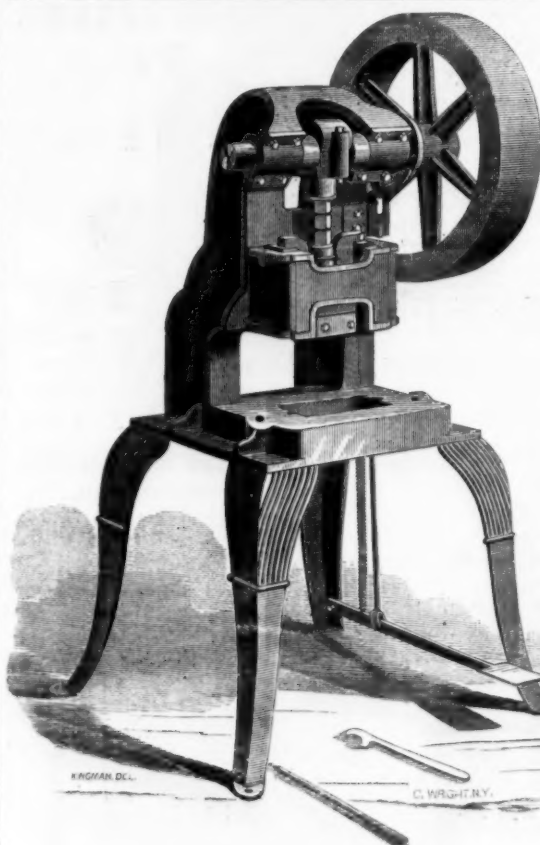
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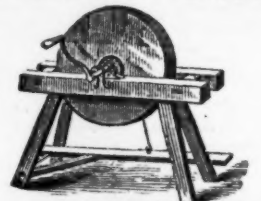
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For dimensions of Governor, see Illustrated Price List.

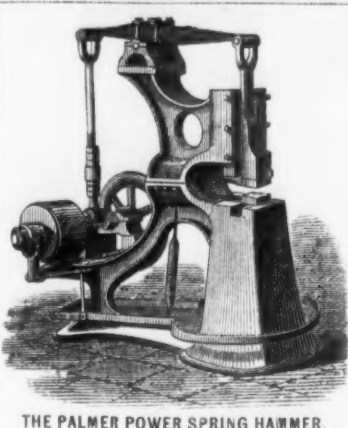


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Improved Steam Governor.

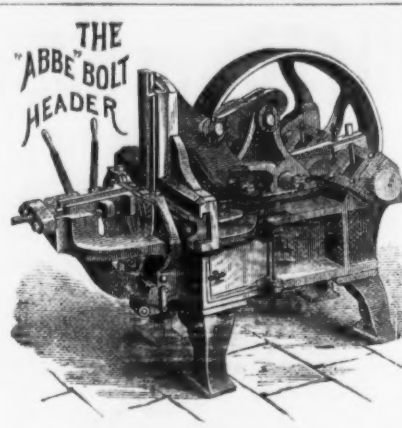
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3	29.00	33.00	1.00	..
3 1/2	35.00	40.00	1.00	..
4	42.00	48.00	1.00	..
4 1/2	45.00	51.00	1.00	..
5	49.00	56.00	1.00	..
5 1/2	55.00	63.00	1.00	..
6	64.00	73.00	1.00	..
6 1/2	74.00	84.00	1.00	..
7	86.00	97.00	1.00	..
7 1/2	94.00	106.00	1.00	..
8	112.00	125.00	1.00	..
8 1/2	125.00	138.00	1.00	..
9	150.00	165.00	1.00	..
9 1/2	185.00	202.00	1.00	..
10	205.00	226.00	1.00	..



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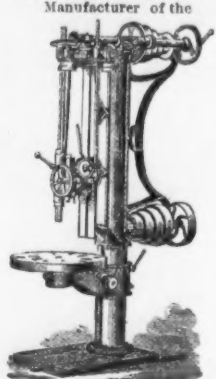


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SAFEST, CHEAPEST & BEST.
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Anti-Friction Metals.

Unequaled for Durability, and Adapted
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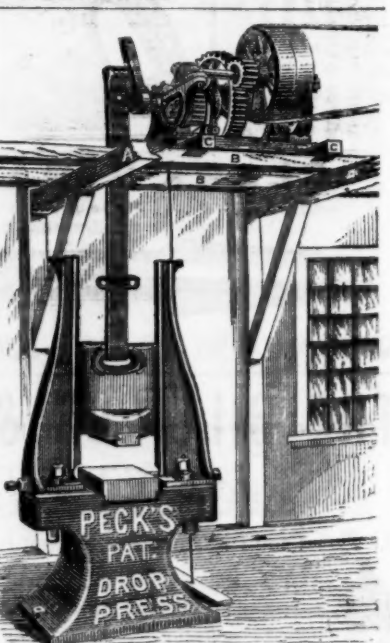
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With or without
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Press. Send for Circular.



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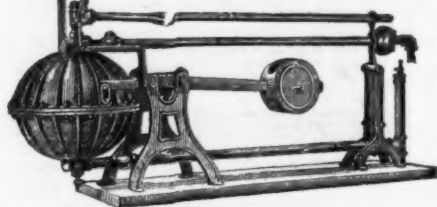
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Patterns in the country—suitable for Forging, and all
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It requires less power, works faster, gives a harder blow
with same weight of hammer, the rebound of the ham-
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the blow is uniform and not affected by variations in
the speed of the driver. It is always in order. The
Drop Press is a specialty.

MILO PECK, New Haven, Conn.

The Albany Steam Trap.



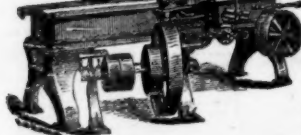
This Trap automatically drains the water of
condensation from Heating Coils, and
returns the same to the Boiler whether the Coils
are above or below the water level in Boiler, thus
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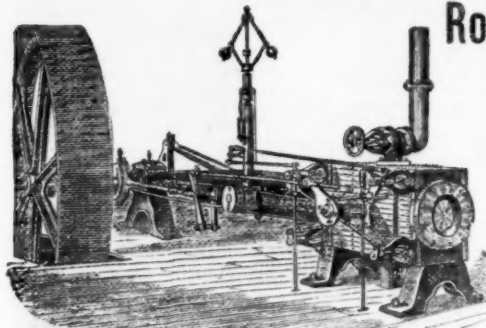
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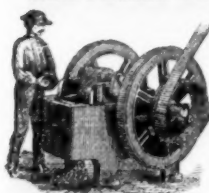
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SPECIAL DRILLS. For Special Work.

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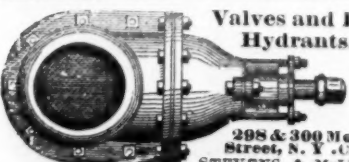


For reducing to fragments all kinds of hard and brittle substances, such as
STONE for making the most perfect MACADAM ROADS, and for making the best
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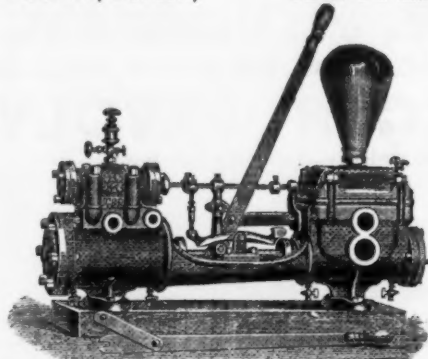
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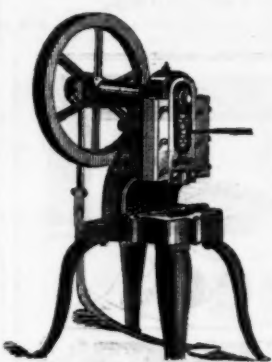
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Mining Pumps (both Double Acting Plunger, and Piston Pattern,) which we guarantee to run abso-
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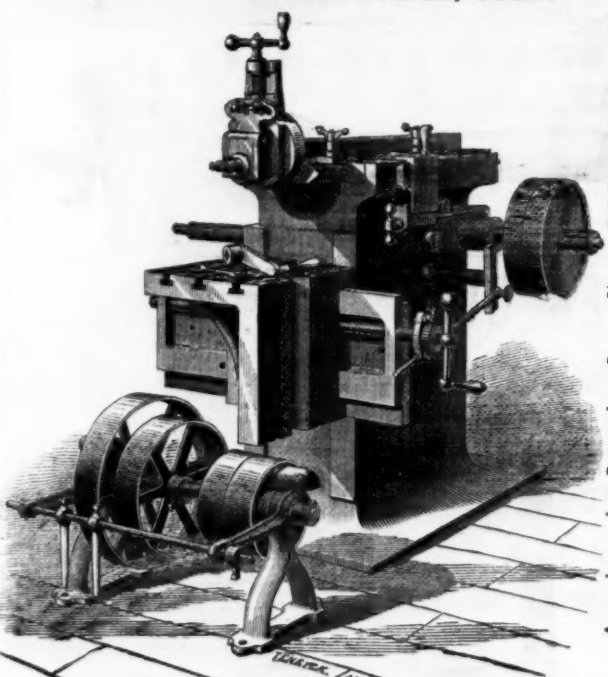
I warrant every part of this Machine to stand the shock
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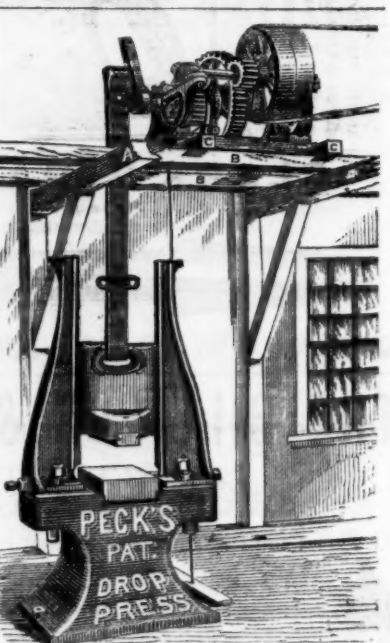
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Patterns in the country—suitable for Forging, and all
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WHY THE BEST:

It requires less power, works faster, gives a harder blow
with same weight of hammer, the rebound of the ham-
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the blow is uniform and not affected by variations in
the speed of the driver. It is always in order. The
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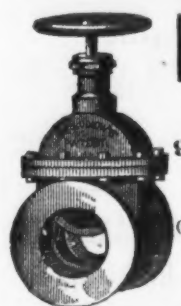
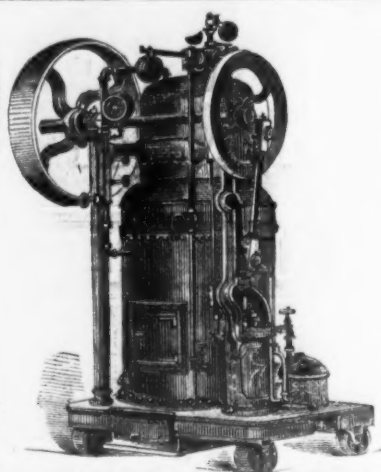
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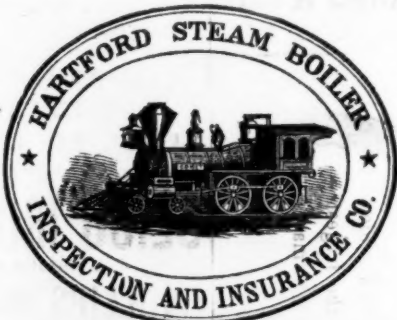
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PATENT BOBBIN WINDING MACHINES
wind direct from
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With Patent Adjustable self-oiling Bearings.
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In Department V, Group 3, at the 44th
Exhibition of the

AMERICAN INSTITUTE,

Held in the City of New York, Oct., 1875.

No. 318, Drawing, Drop &
Punching Presses.

THE STILES & PARKER PRESS CO.,
Of Middletown, Conn.

The machinery exhibited by these makers is of a
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addition to their well known punching presses, to
which a new feature has been added in a press ad-
justable to an inclination for discharging work left
above the die, there are exhibited by them a com-
bined punch and shears, a drawing or blanking press,
and a drop.
In all these there is shown the highest mechanical
culture, applied to meet every practical requirement,
to avoid every practical difficulty, and to enlarge the
range of application of the machines, by devices
which are at once simple, elegant, and effective.
Your committee would unhesitatingly recommend
for this exhibition the "Medal of Progress," but
and such award debarred by the rule of the Institute,
forbidding such award unless a Silver Medal has
been previously awarded. We, therefore, respect-
fully recommend the award of a Silver Medal.
Silver Medal Awarded.
A true copy from the Report on file.
JOHN W. CHAMBERS, Sec'y.

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Steam Pump.

Highest Premium awarded by
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For Simplicity, Economy of
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An absolutely Durable, Cheap, Efficient and Eco-
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EUREKA SAFETY POWER!

Practically impossible
to explode. Tested to 200 lbs
pressure per square inch. Will
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\$250. Also Stationary Engines
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For Connecting Shafting and Gearing.

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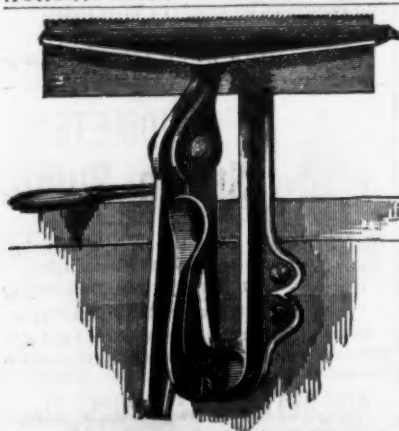
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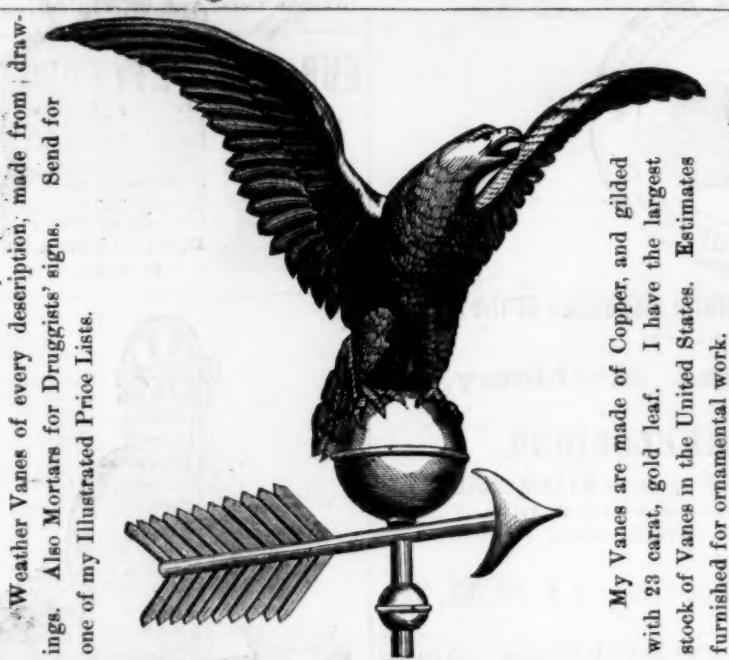


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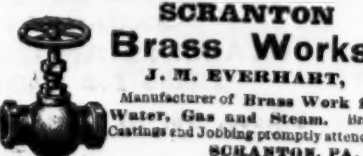
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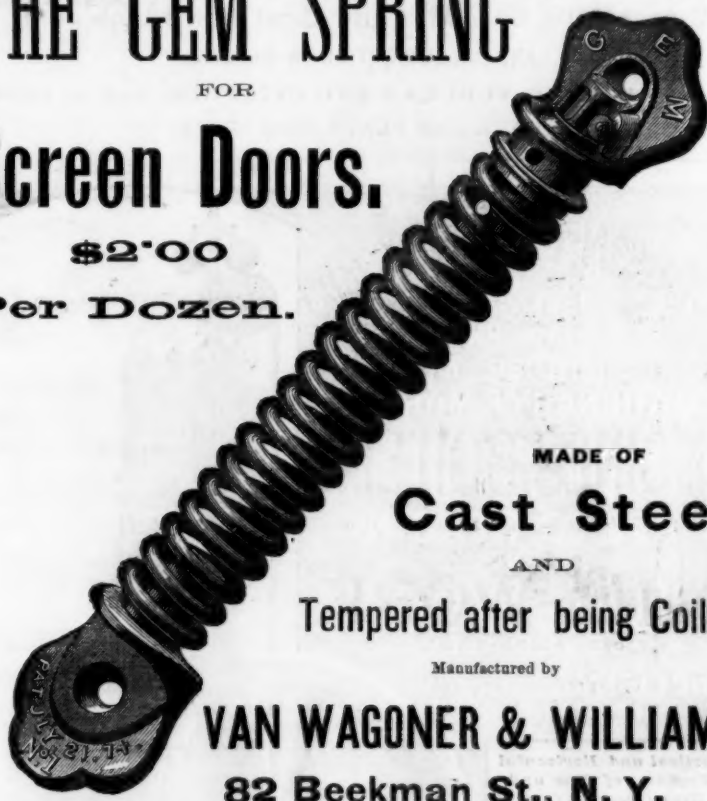
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